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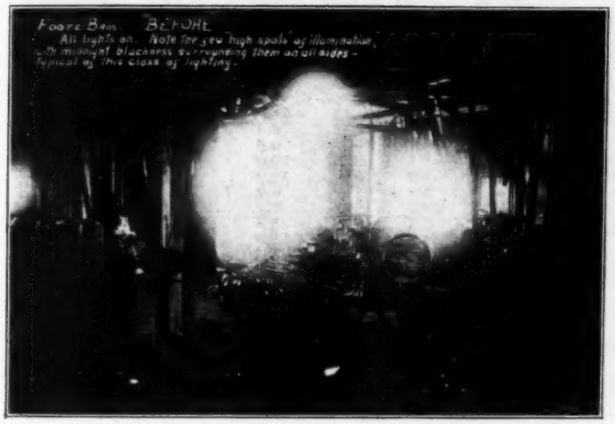
Foote Bros. BEFORE
All lights on. Note few high spots of illumination, with midnight blackness surrounding them on all sides—typical of this class of lighting.

Foote Bros. Gear Works Before Lighting Was Modernized—Note Few "High Spots" With Midnight Darkness Surrounding Them on All Sides.

Foote Bros. Gear Works After Lighting Was Rehabilitated—Milling-Machine Graduations in Plain Sight—No Dense Shadows—All Floor Space Utilized.

Factory Lighting—A Central-Station Problem

Results and Observations of a Year's Campaign for Better Factory Lighting Conducted by Commonwealth Edison Co.—Abstracted from Paper Before Illuminating Engineering Society Convention

By O. R. HOGUE and J. J. KIRK

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PROBABLY no other single lighting subject has received as much recent attention from the society at large and from the technical press as has that of factory lighting. It is not the purpose of this paper to go into the technical details of scientific illumination as qualified engineers have fully covered the subject. Our aim is, rather, to indicate the experience of the Commonwealth Edison Co. in an extensive campaign for better industrial lighting.

To the Illuminating Engineering Society is due the credit for first fostering the idea of better lighting in industrial plants. Many years of effort on the part of the society and its individual members have shown tangible results in the adoption of lighting codes by a number of the states. To merely have a code adopted has not been the single aim of the society, but persistent endeavor has been made to have the new codes as they are adopted reflect present practices of good lighting, as is evident from a comparison of the recent codes with the earlier ones.

A great deal of work has been done to educate the several reflector manufacturing companies and central stations to the value of good industrial lighting, but as yet the real object has not been attained—we have failed to carry this educational work to the average plant owner, who in the final analysis has the sole power to improve lighting conditions.

Impetus was given to better lighting by the standardization of lamps by lamp manufacturers, which has been furthered by a combined effort of the lamp manufacturers and reflector manufacturers in the adoption of a standard reflector. This standardization has made it possible for those who are called on to make recommendations to agree on types of equipment and thus avoid confusing the customer by a multiplicity of equipment. The confidence of the customer is thereby inspired and progress, which is dependent upon sales effort, made easier.

The central-station companies in general have been the ones who have failed primarily to "carry on," this failure on their part being due to a lack of appreciation of the value and extent of this business.

To demonstrate what can be done to consistently improve lighting conditions, it is only necessary to compare intensity and other values given in the paper on "Factory Lighting" by O. R. Hogue and A. O. Dicker, presented before this society at the Cleveland convention in 1914, with the values given in this paper.

In Table No. 1 are data on a number of the larger installations made by the Commonwealth Edison Co.

during the past year, which will serve to show the tendency toward improvement in artificial lighting. It will be noted that the average intensities are more than double those in the installations listed in the former paper. Very little local lighting is used and such local lighting in all excepting one case is a remnant of the old lighting and was not recommended by the central-station engineers. Of course we recognize that some local lighting is needed but it is our aim to reduce this to a minimum.

Where local lighting is needed at intervals, it is suggested that wall receptacles be provided and that extension cords be checked in and out of the tool room just like a special tool. In this way the superintendent is given a chance to control its use and to prevent its becoming a permanent part of the lighting arrangement.

To show the value to the central stations, we have included data on income. In every case the new installation resulted in an increased monthly bill although a few were new customers. This is the sort of business that is most profitable in that it adds no cost to metering and billing and but slightly to the cost of service. Since there is always some other lighting or power-consuming device in use, it is difficult to get an accurate figure on income, but the amounts given are the result of careful study of the customers' accounts before and after the new system was installed.

This indicates conclusively that illuminating engineering service not only benefits the customer, but renders his account more profitable to the lighting company.

The accompanying illustrations showing "Before" and "After" photographs of installations which we have made will help to show the change effected by our efforts.

Table No. II shows the business secured during the different months of the year. It will be noted that during those months which have the greatest amount of darkness, the average watts per unit are more than 200, and the average foot-candle intensity was over 6, indicating that industrial lighting is a seasonal business.

If the efforts of the society to promote good practice are to meet with tangible results, they must be supported by active selling campaigns. The central stations, through their present contact with the customer, are in a better position to push industrial lighting than anyone else. It has been the experience of those who have actively engaged in this work that the entire time of men with special illuminating engineering training must be given to the work if any real progress is to be made.

Although the services of our engineers are always available to architects and owners who wish advice as to the lighting of a new building, our field, as always, has been the established institutions with inadequate lighting. On this account we have the primary difficulty of convincing the customer that a change will prove profitable to him, and this requires a large amount of educational work. Next, he must be shown that the installation proposed is not unreasonable and that the company is not merely trying to get a big income at his expense. As a rule, we must convince

TABLE I.

No.	Class of business.	Kind of work.	Supplementary local ltg.	Units 60 w.	200 w.	300 w.	400 or 500 w.	Total kw.	Ft. above floor.	Aver. foot-candles.	Estimated monthly bill for current.	Estimated increase in per cent.
1	Glove mfg.	Bench	No	—	19	—	—	3.8	8½	8.5	$16.50	New
2	Mach. shop	Screw mchy.	No	—	29	—	—	5.8	9	10.0	64.00	New
3	Mach. shop	Mach. and bench	No	—	70	11	—	17.3	9	9.5	85.00	466
4	Boiler shop	Floor	No	—	—	11	—	3.3	12	10.0	18.00	New
5	Mach. shop	Mach. and bench	Some	—	49	—	—	9.8	8	6.0	50.00	400
6	Mach. shop	Mach. and bench	No	—	20	7	2	7.0	8 & 11	11.0	35.00	133
7	Awning mfg.	Cut and sew	Some	—	14	10	—	6.0	8 & 10	6.0	35.00	200
8	Oven mfg.	Floor and bench	Some	—	—	18	—	5.4	10	6.0	22.50	200
9	Tailor shop	Cut and sew	Some	—	12	—	—	2.4	8	10.0	20.00	New
10	Tailor supl.	Table	No	—	—	14	—	4.2	9½	10.0	15.00	New
11	Weighing mchy.	Mach. and bench	Some	—	34	—	—	6.8	8½	6.0	35.00	250
12	Foundry	Floor and bench	No	—	—	—	44	22.0	16	6.0	180.00	New
13	Foundry	Floor and bench	No	—	13	5	—	4.1	11	5.5	15.00	New
14	Cork mfg.	Mach. and bench	No	—	—	14	—	4.2	10½	11.0	10.00	233
15	Furniture	Floor	No	—	27	—	—	5.4	8½	5.5	30.00	New
16	Electrotypes	Mach. and bench	Some	—	57	1	—	11.7	8½	9.5	70.00	366
17	Candy mfg.	Bench	No	—	—	40	—	12.0	10½	6.0	65.00	1200
18	Paper boxes	Mach.	No	—	86	1	—	17.5	8½	8.0	110.00	120
19	Fdy. and mchy.	Floor and bench	No	—	—	—	21	9.9	10 & 14	7.0	75.00	650
20	Iron and steel	Floor and bench	No	—	10	5	2	4.5	8 & 15	6.5	30.00	New
21	Tool mfg.	Mach. and bench	Some	—	—	55	—	16.5	10	9.0	100.00	300
22	Elec. controller	Mach. and bench	No	—	32	8	—	8.8	9	6.0	30.00	500
23	Wagons and autos.	Floor and bench	No	—	16	—	—	3.2	9	5.0	18.00	46
24	Auto bodies	Floor and bench	No	—	—	27	—	8.1	10	12.0	60.00	300
25	Motor trucks	Mach. and bench	Some	10	28	—	—	7.2	9	8.0	40.00	166

TABLE II.

Month.	No. of units 200 w. or less.	No. of units 300 w.	No. of units 400 and 500 w.	No. of units on rental basis.	No. of units on sale basis.	Total units.	Average watts per unit.	Total kw. connected.	Estimated monthly current cost.	Minimum foot-candles.	Maximum foot-candles.	Average foot-candles.	Average burning hours.
August	296	44	14	140	214	354	192	68.22	$ 245.35	3.0	9.0	5.1	4.5
September	601	54	7	340	322	662	192	127.00	687.30	2.0	12.5	6.4	5.3
October	850	134	2	789	197	986	191	188.73	985.10	3.0	15.0	6.3	4.7
November	691	138	15	475	369	844	214	181.06	876.17	3.0	12.0	6.6	5.0
December	592	73	61	515	211	726	210	152.11	943.00	4.0	15.0	6.7	5.2
January	1,033	146	42	786	435	1,221	228	278.30	1,634.00	3.0	11.0	6.0	6.0
February	644	123	5	642	130	772	207	159.50	932.00	3.0	14.0	6.1	6.0
March	573	59	11	594	49	643	204	131.20	730.25	4.0	10.0	6.0	5.0
April	846	85	8	572	357	939	213	200.30	1,285.17	3.0	12.0	5.9	5.1
May	655	50	0	472	233	705	191	134.68	902.78	3.0	18.0	5.9	4.8
June	958	28	0	347	639	986	212	210.80	1,078.68	3.0	11.0	4.9	4.7
July	801	40	0	709	133	842	180	128.30	667.16	3.0	13.0	3.7	4.0

him that the drop cord is poor economy for general lighting. Then, having sold the idea and the layout, we come to the task of selling the installation, and in this we often fail, for the small contractor, uncertain of his costs at best and willing to hold profits to a minimum to keep his men working, is very likely to underbid us. However, as we furnish blueprints and specifications for each job, if the installation is made along the lines of our recommendations, we do not count the labor lost, for we have made a convert to good lighting and incidentally added a good load to our lines.

One sales point which we have found very effective and which may prove of value to someone is the figuring of the installation down to unit costs. The total price for the job or for the operation of the proposed system may be high enough to discourage the prospect but if it is figured on a basis of cost per square foot and compared with his rental charge, or as cost per employe per month and compared with the payroll, it assumes relatively minor importance.

Our rental and maintenance proposition for factory lighting has met with very gratifying results, appealing to the large as well as to the small plant. In this connection we feel that the maintenance is of great importance. Not only do we give the customer a good installation, but we keep it efficient during the two-year period of the contract and after that we aim to continue maintenance even though the equipment then belongs to the customer.

It has been found by experience that regular cleaning periods must be established, the frequency depending upon the character of the factory or shop, but in no case exceeding 30 days. Since this company uses a lock socket on all its equipment, it has complete control of the lamps, and after the equipment is turned over to the customer he is in a position to place the maintenance in the hands of one man, who should have entire charge of lamp renewals. This method not only prevents the theft of lamps, but also prevents the misuse of equipment by the installation of lamps of wrong size.

In order to raise the standard of lighting and induce plant owners to install systems with high intensities, it was necessary that we have data in the way of actual figures. With this end in view we selected a number of industrial plants where accurate cost records were kept and obtained permission to make a test. First a month's run was made with the old lighting system in use. Then a complete lighting system was laid out and installed by and at the expense of the company, and another month's test made. Finally, with a return to the original conditions, a third month's test was made. The results obtained were highly gratifying and in every case the customer was anxious to retain the new installation. In a number of cases we were not even permitted to go back to the old lighting for the third month's test, for the customer realized that it would mean actual financial loss to him. In making these installations we used so-called triple intensities; that is, about three times the intensity ordinarily recommended, and although few installations are now made with that high a standard, still the average illumination intensity has been very materially raised.

The figures in Table III show the advantage obtained by increasing from the ordinary low standard to a moderate intensity, and also the still further advantage of increasing to a real production intensity. With such facts before us, it seems certain that in productive intensities we have the greatest possibility of service to industry and wide adoption of such intensities is only a matter of getting the truth before the responsible executives.

TABLE III.

Class of business.	Old installation. Equipment.	Watts per sq. ft.	Foot-candles.	New installation. Equipment.	Watts per sq. ft.	Foot-candles.	Average increase in % production.	Total cost in % of payroll.
Iron pulley finishing shop.	Drop cords. 60-w. lamps. Bare or tin shaded.	0.27	0.2	200-w.-C. Reflectocap units..	1.90	4.8	20	5.5
Soft metal bearing machine shop.	25 100-w.-B. deep bowl reflectors.	1.00	4.6	25 200-w.-C. deep bowl reflectors	2.00	12.7	15	...
Heavy steel machine shop.	13 100-w.-C. 23" eye-shield units.	0.60	3.0	13 300-w.-C. in same units....	1.70	11.7	10	1.2
Carburetor assembling shop.	84 40-w.-B., 2 100-w.-C., 14 40-w. drops.	1.00	2.1	19 300-w.-C., 10 200-w.-C. eye-shield units.	1.90	12.5	12	0.9

BROCK & RANKIN - PUBLISHERS "BEFORE"
(Floor space shown on opposite page)
Note wasted light on ceiling and darkness of working plane. Note gloomy conditions and cangested lighting equipment.

Brock & Rankin's Bindery Before Lighting Was Brought Up to Date—Note Variety of Lighting Equipment, Dense Shadows and Inferior Lighting Effect.

Brock & Rankin's Bindery After Lighting Was Overhauled—High Intensity and Good Distribution of Illumination With Minimum Number of Units.

Central-Station Rates in Theory and Practice

Seventeenth Article—Rates Based on Demand—Flat Rates for Display Lighting and Small Consumers—Advantages of Flat Rate—Theory of Rates Based on Energy and Demand

By H. E. EISENMENGER

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This article is the seventeenth of a series which began in the issue of July 12. The first seven articles dealt with the cost of central-station service and formed Part I of the series. Part II comprised six articles on the general policy governing the selection of a rate system. Part III, of which this is the fourth article, discusses the various systems of rates in use; there will be two more articles in this part. Parts IV to VI will treat of rate analysis, accuracy of rates and rate regulation by commissions. The articles will continue weekly until the last issue of the volume (Dec. 27).

PART III—SYSTEMS OF CHARGING—Continued.

II. The Various Types of Rates—(Continued).

C. Rates Based on Demand Only.

1. *Nomenclature.*

SECTION 126. Rates which are based on the demand only of the customer (in watts, kilowatts or some other unit or substitute) are called flat demand rates or simply flat rates.[1] The customer is charged simply in accordance with his maximum demand in watts, kilowatts, etc., and no explicit charge is made for the energy consumption in kilowatt-hours. The latter may be more or less strictly defined by the maximum demand, as in the case of display lighting (see later), or it may be only loosely connected with the maximum demand, as in some cases of residence lighting.

2. *Types of Service for Which Flat Demand Rates Are Used.*

a. Flat Demand Rates for Display Lighting, Etc.

127. The flat demand rate adapts itself most naturally to display lighting service, that is, advertising signs, outline lighting, store windows, etc. This kind of lighting is in use during a certain definite number of hours every day or month, either with all the lamps burning all the time or a certain prearranged percentage of the total capacity burning on the average (flashing signs). The number of kilowatt-hours per year (or per average month) is therefore, with a given kind of sign and use of the sign, proportional to the capacity of the sign, that is, to the maximum demand, and the energy charges can be most naturally averaged into the demand charges, thus doing away with the necessity of employing a meter.

Not infrequently the electric light company furnishes a patrol service for lighting and extinguishing the sign lights at the correct prearranged time. The lapms are, of course, lighted at dusk and they are extinguished usually at 11 o'clock, at midnight or at dawn, as local conditions warrant or the customer desires. The charges for this patrol service are then included in the flat rate charges.

The ways in which the payments are made to depend on, and vary with, the maximum demand are very diversified. One group of rate schedules makes the charges proportional to the capacity of the sign in watts. We may have then what might be called a straight demand flat rate, in analogy with the straight meter rate[2], usually with a minimum charge. Or the rate may be framed as a block demand rate, in analogy with the block meter rate[3]. An explicit customer charge may also occur[4].

Another group of display lighting schedules make the charges depend not directly on the number of watts connected, but they charge a certain specified amount for every standard size of lamp. This is not quite the same, if the charges per lamp are not exactly proportional to the wattage of the lamp. The charges

[1] In England the term "flat rate" is used to designate straight meter rates.

[2] Erie Pa.: 1.5 cents per watt connected, with minimum charge of 75 cents. East St. Louis: 0.85 cents per watt connected, with minimum charge of $3. Both rates are charges per month for lights burning from dusk to midnight.

[3] St. Joseph, Mo.:

8 cents per 10-watt lamp, first 100 lamps
7 cents per 10-watt lamp, next 100 lamps } from dusk to 11 p. m.
6 cents per 10-watt lamp, excess lamps

For another example see footnote 6 (Macon, Ga.).

[4] Rockford, Ill. (optional): Customer charge $12 per year added to the demand charge of

$ 5 per year per 25-watt Mazda lamp
$ 8 per year per 40-watt Mazda lamp
$12 per year per 60-watt Mazda lamp
$20 per year per 100-watt Mazda lamp
$30 per year per 150-watt Mazda lamp
$50 per year per 250-watt Mazda lamp

As the demand charges are strictly proportional to the wattages of the lamps, this rate is the equivalent of a straight demand rate with a customer charge superimposed.

[5] Peoria, Ill.:

Size of Lamp, Watts.	Cents per Lamp per Month. Dusk to 11 p. m.	Dusk to midnight.
5	5.1	6
10	8.5	10
20	17	20
25	21.25	25
30	25.5	30
40	34	40
60	51	60

This is a straight demand rate with exception of the 5-watt lamps where the charge per watt is greater than with the rest of the lamps.

South Bend, Ind.:

Size of Lamp, Watts.	Cents per Week.	Equals Cents per Watt per Week.
2.5	2.5	1
5	3	0.6
10	5	0.5
15	7.5	0.5
20	10	0.5
25	12.5	0.5
40	18	0.45
60	25	0.42
100	40	0.40
150	50	0.33
250	80	0.32
500	150	0.30

Minimum charge 25 cents per week. Here, as the last column shows, the charges per watt decrease pretty regularly from 1 cent per watt per week down to 0.3 cent per watt per week.

per watt of lamp capacity are generally smaller for the larger lamps than for the smaller ones.[5] This deviation from strict proportionality is occasioned by the fact that the charges in these cases include the renewals of burnt-out lamps. The price of a large lamp per watt is smaller than that of a small one, whereas the cost of labor for renewing the lamp is independent of the wattage of the lamp and this labor cost is by no means small on roof signs, etc. Moreover, the signs with the larger lamps are on the average the signs of greater total capacity and their users are therefore the larger consumers.

Some central stations diversify their flat rate schedules for display lighting according to the time during which the sign is being used, or, since all signs are lighted at dusk, according to the time when the sign is extinguished.[6]

The charges are generally figured per month, but occasionally display lighting schedules can be found which charge per year[7] or per week.[8]

In a few instances flashers on the signs are quoted in the schedules as bringing about a reduction of the charges.[9] From the theoretical point of view this is correct as it reduces not only the energy consumption of the sign but also the kilowatt demand on the central station and its lines on account of the diversity between a number of flashing signs. This means that the period of lighting of the sign will coincide with the period of darkness of some other sign, so that the total demand of all the flashing signs is smaller than the sum of the maximum demands of the individual signs in the ratio of the periods of darkness to the total time the flasher is connected, that is in the ratio of the energy consumption saved by flashing.

The great majority of electric light companies which have special schedules for display and sign lighting employ flat demand rates for that purpose.[10]

There are some other kinds of service which share the characteristic of the display and sign lighting service inasmuch as the number of burning hours per month can be predicted with a fair degree of accuracy from the size of the installation, so that for a given demand the monthly or yearly energy consumption is fairly well known without employing a meter. These services are chiefly commercial lighting[11] (stores) and all-night porch lighting.[12] The employment of flat demand rates based on the rated capacity of the installation is, however, by no means as general for these purposes as it is for display lighting; on the contrary, it is rather the exception than the rule.

b. Flat Demand Rates for Small Customers.

128. Flat demand rate schedules are used also for the service of residences, small stores, etc. Whereas with the display lighting customers, treated in the preceding Section 127, the advisability of the flat-rate lighting schedule is based on the fact that for every consumer the energy consumption is practically proportional to the maximum demand, no such statement can be made for the small customers, such as residences, etc. The energy consumption of various residence consumers with the same maximum demand may indeed vary within rather wide limits. The reasons which recommend the employment of a flat demand rate for small residences and stores are entirely different from what we saw in the case of display lighting.

The chief reason is the large reduction of the "customer cost" which can be effected by the flat demand rate through elimination of the customer's individual meter. From what has been previously explained (Sections 54-55) about the "customer cost," it is obvious that a large part of the "customer cost" consists of the expenses incidental to the meter, that is, capital charges on the meter, meter reading, meter maintenance, computing of the bills, etc., and this is eliminated by using a flat demand rate. Now the customer cost, as stated in Section 56, has the order of magnitude of 50 cents or one dollar per month per customer and therefore constitutes a large part of the total cost of serving a small customer. Consequently, if we are able to reduce the "customer cost" of the small customer, we will reduce the total cost of that customer's service in a proportion which is not much smaller than the percentage reduction of the customer cost. Therefore the charges to the small customer for a certain service can be made lower under a flat demand rate than under a meter rate, even though the profit to the company is not reduced or possibly even enhanced as compared to the profit from the same service if furnished under a meter rate. It has been shown before (Section 97) that cheapness of the service to the small customer is essential since money is of greater value to those customers as a class.

In addition to the cheapening of the service for the reasons just discussed, the flat demand rate permits of simplification in the office work of the company for the small flat-rate customers, especially if certain wattages are standardized for the capacity of flat-demand-rate installations to the exclusion of all

[6] Macon, Ga.:

Watts Connected.	Cents per Watt Connected. Burning till midnight.	Burning all night.
First 500	1.8	3.3
Next 500	1.4	2.5
Next 1000	1.1	2.0
Next 2000	1.0	1.8
Excess	0.9	1.6

See also footnote 5 (Peoria, Ill.).

[7] See for instance footnote 4 (Rockford, Ill.).

[8] See for instance footnote 5 (South Bend, Ind.).

[9] Topeka, Kans.: 5.5 cents per 5-watt Mazda lamp instead of 6 cents; Birmingham, Ala., states that a flasher discount is made in proportion to the current saved, usually about 40%.

[10] Among the few exceptions to this rule are the following: New York City (three of the companies operating in the territory); Rockford, Ill., (one of the optional display lighting rates); Sacramento, Cal., (Pacific Gas & Electric Co.). All of these employ straight meter rates for that purpose. Birmingham, Ala., has a step meter rate for display lighting, in which the lower kilowatt-hour charge takes place not after a certain energy consumption has been reached but after the connected load exceeds 3000 watts. Muskogee, Okla., has a block meter rate for display lighting.

[11] Commercial Lighting, Pueblo, Colo.:

Hours per Night.	Price per 100 Watts per Month.
6	$1.00
8	1.15
10	1.25
12	1.35
14	1.45
16	1.55

The company reserves the right to set check meters and to bill the excess at 5 cents per kw-hr.

Flat Rate Commercial, Canton, Ohio:

Tungsten Lamps.	Daily Use in Hours. 6	10	15
250-watt	$2.50	$3.30	$4.00
150-watt	1.75	2.00	2.50
100-watt	1.10	1.30	1.60
60-watt	.75	.85	1.00
40-watt	.50	.60	.75

[12] Flat Rate for Porch and Hall Lighting, Waterbury, Mass.:

$1 per 10-watt lamp per month.

Porch and hall lights, being intended as all-night lights for protection against burglars, etc., should be charged at lower rates—reduced per kilowatt-hour—than the ordinary residence lamps because otherwise no customer would avail himself of that rate and that kind of lamps would be burned under the ordinary residence rate, if at all. The electric light company can afford to give cheaper rates—reduced per kilowatt-hour—for that kind of service not only on the basis of the value-of-service principle but also because the cost per kilowatt-hour is lower on account of the good load-factor. A kilowatt-hour consumed in the regular residential lamps will be largely used during the peak hours of the central station, whereas if consumed in an all-night porch light the largest part of the energy will be demanded at off-peak hours. On the other hand, the cost will be enhanced by the cost of inspection, or in the absence of these, by the use—fraudulent or otherwise—of larger lamps than contracted for by some of the customers.

other wattages. Thus, for instance, it might be stipulated that the maximum demand of every flat-rate installation must be rated at a multiple of 25 watts between the limits of 75 and 300 watts. This would mean that the customer has ten different standard wattages to choose from if he wants to be served under the flat demand rate. Then we might have ten different sets of bills, receipts, etc., printed, each with the correct amount imprinted, thus saving clerical work.

The simplification can be carried to such an extent that neither bills nor collectors are sent out to the flat-rate customer. The flat-rate customer is required to take care himself that his monthly or quarterly payments reach the company before a certain day of the month (or quarter) without waiting for a bill as the other customers.[13] Payments can be made at the company's offices or at the agencies appointed by the company all over the city.

Finally the company's dealing with individual consumers on the company's books in the monthly routine work can be eliminated altogether, as far as the small flat-rate customers are concerned. This is done by assigning to each flat-rate customer an identification number within a group. Each group comprises all customers whose demand amounts to a certain one of the standardized numbers of watts (see above). Each customer of a certain group has then to pay the same amount per month as every other customer of the same group. The electric light company then deals only with the entire groups of customers on the company's books, at least in the regular course of operations, that is, if the customers pay regularly, or do not change their contracts, etc. Those customers who do not pay in time or who change their contract, etc., must of course always be singled out and dealt with individually, which causes extra expense; but even there the schedule could be framed in such a way that the customers who require individual dealing are charged a little additional fee in that month to cover the extra expenses.

These simplifications with their incidental cheapening of the service are not used as much in this country as they might be and as they are in Europe.[14]

Another advantage of the flat demand rate for small customers is the possibility of exactly and definitely foretelling to the prospective customer what amount he will have to pay every month for the lighting of his home with a given installation. This makes it easier to induce these small customers to try electric service than where they are to be served on a meter basis and where therefore no definite promise can be made as to the cost of the service.[15]

129. Nothing has been said so far about the method of determination of the customer's maximum demand for the residential flat demand rate. Simply using the number of the sockets connected for a basis and leaving it to the discretion of the customer what size of lamps he wishes to use would be too inaccurate for a flat rate; this method is at present nowhere employed for a flat rate in this country as far as the writer is aware. Using the connected load in watts as a basis for charging the residential customers, as in case of display lighting has also certain disadvantages. Whereas in case of display lighting the illicit exchange of lamps by the customer for larger ones or the unauthorized installation of additional lamps would be easily detected by an observer on the street, frequent surprise inspections would be necessary in case of residential consumers to be safe against unauthorized increases of the customer's wattage, whether fraudulent or unintentionally. These inspections would be, to say the least, cumbersome, costly, and inefficient, and would frustrate the object of the flat demand rate, viz., to make the cost of service low.

Special sockets into which the ordinary lamps would not fit have been tried, the lamps for these sockets which are not obtainable on the market being furnished by the electric light company. The disadvantages of this system are so great that to the writer's knowledge this method is no longer in use anywhere. In the first place dealers cannot easily be prevented from eventually selling lamps with bases to fit into these special sockets and in the second place lamp sockets have been standardized during recent years with an expense of work and money much greater than the outsider would suspect, so that every attempt to introduce nonstandard sockets nowadays means a step backwards.

Similar considerations apply to the use of low-voltage lamps (for instance 55 volts) for residential flat-rate customers to prevent the customers from buying higher wattage lamps and inserting them into the sockets. Strenuous and successful co-operative efforts are being made at present by the electrical industry to exclude all but a very few standard voltages (110, 115, and 120 volts) in order to reduce the cost of production.[16]

Monthly measurements of the actual maximum demand would bring accurate results, but they would necessitate just what we want to avoid with the introduction of the flat rate—the installation of expensive measuring instruments for every consumer which necessitate periodic reading, etc.

130. The best method is to prevent the small flat-rate consumer by automatic devices from using a larger wattage than he has contracted for. This is done by the use of an inexpensive instrument called "demand limiter" or "current limiter" or sometimes, though not quite as accurately, "demand indicator." As soon as the customer at any time switches on a larger wattage than he is allowed under his contract, that is, as soon as he uses a current in excess of what he has paid for, this instrument, which is connected in series with his entire installation, will rythmically break and make the circuit until the excess current is turned off again. The current is broken about 20 to 300 times a minute according to the make of the instrument. This causes a very disagreeable flicker of all the lights in the entire installation which warns the customer that he has—intentionally or otherwise—

[13] It is even feasible to require that these payments be made in advance, since their amounts are definitely known in advance. Losses from bad debts and expenses for collecting back payments can thus be restricted. The principle of prompt-payment discounts or delayed-payment penalties, respectively, (Section 110) can as readily be applied to the flat rate as to the meter rate.

[14] See also S. E. Doane: "The Successful Handling of the Small Consumer in Europe," Proceedings of the National Electric Light Association, 1914, also reprinted in Electrical World, May 23, 1914.

[15] As to the good results obtained by flat demand rates for soliciting the small consumer, see Earl A. Whitmore: "The Value of the Poor Man's Business," Electrical World, Jan. 22, 1916.

[16] Only very few examples of flat residence rates on the basis of the connected load could be found by the author.

Dallas, Tex., charges per month:

$0.60 per 16-cp. lamp for 3 to 5 lights.
$0.50 per 16-cp. lamp for 6 to 8 lights.
$0.40 per 16-cp. lamp for 9 to 12 lights.
. . . . . etc. . . . . .

All the other instances found (three in number) are close together, in Connecticut, and apply to the use of low-voltage (55-volt) lamps, for instance: Hartford, Conn.: $1 per month for ten 10-cp. low-voltage tungsten lamps, 6 cents for each additional lamp; $1.50 for ten 20-cp. tungsten lamps, 12 cents for each additional lamp.

exceeded his allowance and which most effectively induces him to shut off the excess wattage. This kind of flat demand rate is sometimes called the "controlled flat rate."

This instrument acts on the principle of an ordinary electric bell. It is so adjusted that it does not work unless the current passing through it exceeds a certain amount, namely the equivalent of the wattage for which the customer has contracted. These instruments require no periodic inspection as the meter and they are much simpler in construction and therefore cheaper than the meter.

The customer may now have installed as many and as large lamps as he chooses, but he never can burn a larger wattage at any time than what the current limiter allows to pass, that is, what the customer's contract permits. The greater, however, the ratio is of the installed capacity to the contracted maximum demand the oftener the current limiter will come into action and this, of course, means annoyance and dissatisfaction to the customer. If, for instance, a customer sits downstairs in his home reading and his daughter turns on the light in her own room at a time when the entire contracted demand is being used, all the lights in the entire house will begin to flicker and thereby cause a certain amount of inconvenience. It is but human that the customer does then not blame himself for not having contracted enough wattage to cover his needs but that he curses the electric light in general and the electric light company in particular. Such a thing never had happened to him before he had electric light. To avoid this it seems good policy on the part of the electric light company to make a rule in the flat-rate schedule that a customer must contract for the entire wattage of his installation or at least for a certain stipulated minimum percentage of that wattage.[17] If the lights then begin to flicker it is a warning to the consumer that he has violated his agreement and it is brought home to him forcibly that he is doing something wrong so that he is the one to blame and not the electric light company.

The "controlled flat rate" is especially suited for the man of small means and by turning a large number of individuals into satisfied customers it contributes towards strengthening the good-will of the public towards the electric light company.[18]

D. Rates Based on Both Energy Consumption and Demand.

1. *Introduction.*

131. Since the cost of service to a certain customer depends, as we have seen, about as much on the energy consumption as on the maximum demand, a rate which contains these two elements will in general be more accurate than any rate which contains only one of these two elements; that is, the unintentional deviations of the charges from the cost (plus a fixed percentage of profit) can be avoided more effectively. (This will be explained in Part V, "Accuracy of Rates," Section 171). The charges from the two elements of energy consumption and demand may or may not be combined with a customer charge and in this manner we get either three-charge or two-charge rate systems under this heading.

2. *Determination of the Demand.*

a. Theory and General Remarks.

132. As shown in the theoretical part of this series of articles (Sections 27-29 and Insert VI), the exact evaluation of that portion of the central station's capacity which is determinative for the demand cost of a certain customer is so complicated an undertaking that an attempt to introduce it into general practice without far-reaching approximations would be hopeless.

The first step of approximation towards practical determination of the portion of the central station's capacity just mentioned and with that towards determination of the customer's demand cost and demand charge is the assumption that the demand cost is proportioned to the peak responsibility, that is, to the kilowatt load which the customer draws from the central station at the time of the peak-load of the latter, assuming as peak-load time of the central station not an instant, but a certain short interval of one or several minutes or hours duration. This latter assumption is necessary not only for practical reasons, inasmuch as the top of the central station's load curve is too flat to permit of pointing out one definite second of the year as bringing a heavier load on the central station than any other second of the year, but theoretical considerations prove it to be correct so that we would use it even if our measuring instruments were accurate enough to determine just at what second the absolute maximum of the central station has occurred. It has been shown in Insert VI that, whereas the customer's load at every single moment of time has a certain influence on the customer's demand cost, the influence of the customer's load is practically imperceptible during those moments of time when the central station's load, expressed in percentages of the central station's peak load, is not large. On the other hand, during those elements of time when the central station's load is near 100% of the central station's peak load the influence of the customer's load is paramount, so that these latter moments of time can be exclusively considered. But the decrease in the importance is a steady though rapid one as we go from the 100% limit downwards; in other words, the influence of the moment with the central station's real peak load (100%) is not of a greater *order of magnitude* than that of a moment with 99.9% or 99% load,[19] etc., and there are no *abrupt* changes in the degree of influence as we go down the scale of percentages on a continuous load curve.

We have therefore to take the customer's demand during a certain interval of time when the loads are near 100% and, as the customer's demand will in general vary during that interval, we will have to take

[17] The controlled flat rate of Scranton, Pa., specifies that the demand shall not be less than 75% of the total sockets installed at the rate of at least 25 watts per socket (with a few secondary exceptions).

[18] Examples of the controlled flat rate: Worcester, Mass.:

Watts Demand.	Net Charges Per Month.
100	$1.00
125	1.25
150	1.45
175	1.65
200	1.85
225	2.05
250	2.25
275	2.45
300	2.65
325	2.85
350	3.05

It is easily seen that this means a (net) charge of 0.8 cent per watt plus a customer charge of 25 cents (with exception of the 100 watts demand, which is 5 cents lower).

In Allentown, Pa., the charges of the controlled flat rate are diversified between residences and stores and in the latter class they are again diversified according to the time of closing in the following manner:

1 cent (net) per watt per month for residences.
1.5 cents (net) per watt per month for stores, etc., closing at 9 p. m. or earlier.
2.0 cents (net) per watt per month for drug stores, saloons etc.
2.5 cents (net) per watt per month for establishments open all night.

[19] The former (100% load influence) may even be smaller than the latter (99.9% or 99%) although as a rule it will be larger.

the average of all the customer's instantaneous demands during that interval.

We have then to define the "peak responsibility" as the average of the customer's instantaneous demands taken over a given or chosen interval of time. This term "average demand taken over a certain interval of time" is not as definite as it seems at first sight. This question, which is of secondary practical importance, has been dealt with in Section 34-37.

The question now suggests itself how large the interval should be over which the customer's instantaneous demands are to be averaged in order to furnish the most exact result. The solution of this question depends entirely on the shapes of the load curves. In order to solve that problem for a particular case we would first have to find out how large the correct unapproximated value of the demand cost is with the given shape of the customer's and central station's load curve (Insert VI). But the object of the whole approximation is to avoid just that complicated calculation of the true value. We will therefore have to select more or less by guesswork some standard length of interval over which the customer's demand is to be averaged.

Fortunately it does not make much difference generally whether we use those moments of time when the central station's load is above 95%, or when it is above 98%, or 99%, etc. It does make a difference with an individual consumer whose load curve has a freak shape containing large and abrupt rises and falls during the assumed interval of the central station's peak which are symmetrical to the latter, but with the ordinary shape of load curve the duration of this interval is not a matter of great importance.

What would be the effect of using too large or too small values for that interval? If it is chosen too short, this would mean penalizing a customer who once in a while, as an exception, or even as a consequence of an accident has a heavy but short demand. This short demand would as a rule not necessitate the electric light company keeping an additional equipment of the same capacity in readiness as the chances are that these exceptional demands do not occur during the central station's peak-load time. Even if they do, they will affect the central station's size in a much smaller measure than the amount of kilowatts of the maximum demand indicates, because these extremely short demands of a number of customers would not come all at the same moment but generally one after the other; in other words, the diversity-factor between these peaks would be very great on account of their short duration. This penalizing of the very short demands would result in a corresponding unjustified favoring of the customers with demands which are steady during a longer interval of time and thereby do not give the possibility of a large diversity so that they affect the central station's size in a much greater measure than the same number of kilowatts would for a short period. If we go to extremes, the customer might have to pay during the whole month, or even year, for the current occasioned by a short-circuit in his installation.

On the other hand, if the interval is chosen too great, the element called "peak responsibility" loses more and more the character of a real peak responsibility by approaching more and more the element of energy consumption. This is best illustrated by again assuming the extreme case, which now means that the interval within which the "peak responsibility" is to be measured (averaged), is no longer so small as to be measured in minutes or even hours, but extends over the entire 8760 hours of the year. In that case the rated "peak responsibility" would be the average demand of the customer over the whole year and would be proportional to the customer's yearly energy consumption.

133. The next step towards enabling practical application is the replacement of the customer's peak responsibility as basis for the demand cost (or for the demand charge respectively) by the customer's maximum demand, regardless of the time when the latter occurs. With this approximation we arrive at a method of general practical applicability.

The maximum demand of the customer is usually not defined as the instantaneous maximum demand, but the demand as averaged over a certain given interval of time, just as this has been done in the first approximation with the customer's peak responsibility and for the same reasons. That interval of the given length within which the demand averages to a larger amount than during any other interval of the same length is then selected and the average demand during that particular interval is the rated "maximum demand." The maximum instantaneous demand must not necessarily occur during the same interval.

(To be continued.)

ERRATA.

We have had our attention called to two errors in Mr. Eisenmenger's eleventh article, which appeared in the issue of Sept. 20. On page 474 there is an error in Fig. D. The abscissa OA' should equal m_o and $A'B'$ should equal M_o. The corrected Fig. D is reproduced herewith.

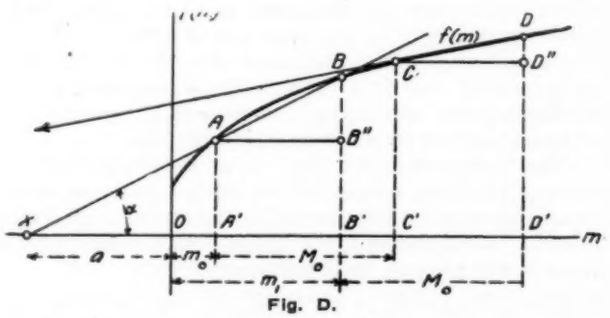


Fig. D.

On the same page a little below Fig. D, there is an error in the sign between the two parts of the modified relation (24). It should read as follows:

Multiplying by (-1) and adding $(b_1 - b_o)$ to both sides (24) becomes

$$(b_1 - b_o) - [f(m_1) - f(m_o)] \leqq$$
$$(b_1 - b_o) - [f(M_o + m_1) - f(M_o + m_o)]$$

FRANCE MAY USE POWER OF WAVES TO SAVE ITS COAL.

Practical experiments to determine the possibility of utilization of tidal power to make good for the coal shortage under which France is expected to suffer for a long time will be carried out under government auspices in St. Briac bay, on the north coast of Brittany. A committee has been appointed for the scientific investigation and study of hydroelectric power, and will undertake the experimentation by government orders.

Experiments are also being conducted to determine the possibility of replacing coal partly by gasoline.

Development of Favorable Public Opinion Toward Utilities

The Policy of Decrying Publicity and Information Has Changed to One of Taking Public Into Confidence — Employes and Stockholders Can Help—Paper Before Illinois State Electric Association

By JOHN F. GILCHRIST

Vice-President, Commonwealth Edison Co., Chicago.

A FEW months ago a prominent St. Louis banker spoke before a meeting called to consider the situation of the street railways, and stated that in the language of the street "they were getting just what was coming to them," or in more poetical language, "they were reaping the whirlwind." The well-informed men who listened to him felt that he was probably taking an extreme position to which he himself did not fully subscribe, in order to point a moral, or, if not, he was unreasonably severe, was not up-to-date and posted on the changed conditions which have prevailed during the last 80% of the time since public utilities came into existence, and that he had not analyzed the situation fairly. Furthermore, seriously or for effect, he was taking a view of the situation from the standpoint of an outsider, not appreciating the complicated fabric which linked his business with the one he was denouncing, which, if seriously injured, must injure his own business together with all others. In other words, he was sawing off the limb on which he was sitting—between himself and the tree—and yet this man's views typified the views of thousands of other people of like standing with himself as to intellect and judgment, and of tens of thousands of people not so well equipped to understand such matters, but who constitute the great rank and file of the people, who by their votes govern this great country of ours.

J. F. Gilchrist.

Early Appreciation of Public Utilities.

In the early stages of the public utility business people had not learned to give much thought to the rights of the public. The situation was quite different, and it was very natural that the managements of utilities, who looked upon their business as being private enterprises, should consider that they were conferring more of a favor upon the public than the public was conferring upon them. In the case of many public service corporations, all sorts of inducements in addition to liberal franchises were offered to encourage them to start in various communities. The people at those periods of the inception of the business having never enjoyed service of this kind apparently had the fullest appreciation of the value of utilities. Furthermore, they apparently recognized the fact that the public utility man was not the inventor of the systems newly discovered at that time, and that he not only had to pay more for patented apparatus (the inventors not being willing to forego their fair reward because the service was to be rendered to the public) but the future of the business was not assured and he had to pay high prices for money for investment purposes.

Starting in this way, utility managements have not appreciated the change which has taken place in the view of the people, and have not realized the importance of keeping the people informed. In fact, a well recognized policy, and unfortunately one which generally received the support and approval of the ablest managers, decried publicity and information. It adhered to the plan of sitting tight and saying nothing, regardless of the viciousness of attacks made upon them, apparently believing that this policy would result in such attacks wearing themselves out and charges being forgotten. Even at this date, when almost any body of intelligent men meeting for conference would agree that the best policy was to take the public into confidence, many managers will, as individuals, hesitate to be frank and open with the public, and if they put forth any statements at all, they will not make a full statement.

Now, it is common knowledge that differences between individuals almost invariably grow out of a lack of knowledge of what prompts certain acts. If two men doing business together know each other very intimately and they are both fair and honest, there is rarely any chance for trouble between them, but if they are not acquainted and attribute all kinds of motives to each other's acts, suspicion and distrust is likely to arise, which frequently leads to open rupture. The situation is no different as between a public utility and its customers, and there is much more chance for trouble in such a relationship because customers realize, generally speaking, that they can get the service rendered only from one source, whether they will or no, and they are much more likely to attribute avariciousness and wrong motives to the vendor under such circumstances than they are under any business relation where the purchaser can take his trade elsewhere if he is not satisfied.

Public Opinion All Powerful.

In this discussion we can assume that public opinion is all powerful, especially under a government such as ours, and that the cultivation of favorable public opinion toward any project which would succeed is not only desirable and necessary, but imperative. Public opinion generally builds up slowly. An adverse public opinion may reach serious proportions before

pronounced evidence of its existence become particularly apparent, and when it has reached this serious stage it can only be overcome by a similar slow, painstaking process like the one which resulted in its creation; like a disease, it must run its course, and notwithstanding the application of remedies, it will generally go on to its crisis with attending disasters to those who have incurred its displeasure.

In every public utility, as in most undertakings, there are five principal factors—the public, the customers, the owners, the employes, and the management. In the development of favorable public opinion it is by efforts directed at or through these factors that all results will be obtained, and the attitude of these various branches toward each other will have most decided bearing on results. Let us assume that the management is honest and fair towards its customers, its employes, and the public, or at least that it intends to be, because many times the two things are not synonymous. A management may, from its viewpoint, believe itself to be most high-minded and most fair, but it is always dangerous to attempt in your business to administer justice, you being the sole judge of what is just. The wise management will miss no opportunities to see its motives and policies through the eyes of its customers and the public, and if in addition it will adopt the policy of considering in the investigation of all questions from the people that the customer is right and the company is wrong, until the contrary is proved, it will do much to establish fair methods and to set up in the community as a fair and popular institution.

Utilizing Employes to Build Up Favorable Public Opinion.

In the ordinary utility with a large number of employes, there is, in the building up of favorable public opinion, no more effective means than by utilizing the employes in all such activities. A careless, thoughtless, neglectful and surly body of employes can do more to injure the standing of a company than the management can by other means possibly offset, and if such a situation exists it is without question the fault of the management. Continuous work should be done, first, to make the employes realize that they and the management are all partners in an enterprise which, if successful, will be to the personal advantage of every one in the company, and, if not successful, will be to the disadvantage; second, to educate employes to realize what a factor each one of them is in establishing the company in the good graces of the public, and what a bearing their little every-day acts in their intercourse with the company's customers and the public have in developing public opinion. The employe who comes in contact with the public is the company from the standpoint of the customer, and the former's attitude is looked upon as the attitude of the company. If he is fair, courteous, faithful and painstaking he will make friends for the company; if the reverse is true he will make enemies, and, if anything, it is probably a little easier to make enemies than it is to make friends under such circumstances.

Aside from intercourse with the customers and the public in the ordinary course of his duties, the employe can do an incalculable amount of good to the company by talking about it on all occasions, praising its good qualities, explaining its difficulties and its ambitions, showing what it hopes to accomplish, and the ideals of service it believes in and is striving for. Too often in the public utilities this great factor is neglected; employes are not encouraged to support of their own company, and all too frequently are actually aligned against the company in its difficulties and relations with the community. This attitude must certainly grow out of a greatly neglected opportunity on the part of the management, as loyalty and pride in one's own institutions is not at all a rare human quality, and should be properly built up and directed. The mistake too frequently made by managements with regard to gaining the assistance of their employes is that they do not realize how small the opportunity of many employes is to learn the policy of the company and to learn enough about it and its affairs to appreciate what it is and what it is trying to do, and, consequently, how poorly equipped they are to explain these things to others. A management can hardly spend too much time and money in properly educating, cultivating and directing its employes along these lines.

Public Utility Should Have Personality.

A public service institution should have a personality in the same way that an individual or a firm has. We all have had the experience of seeing some popular young men who have joined in partnership develop a business. As long as the owners come directly in touch with their customers or are in daily contact with and supervise the employes who do come in contact with the customers, an atmosphere of service and courtesy is developed which makes for the success of the institution, but when it becomes so large that the management representing the owners and having high ideals as to the kind of service to be rendered to the customers becomes separated from the employes who are actually getting in touch with the customers, there is the gravest danger of a situation arising which may lead to misunderstandings, the lack of proper service, and trouble for the company. In all plans for the cultivation of the good will of your customers and the public the writer urges managements to be thoroughly alive to this danger and ever alert and diligent in seeing that there is no perversion of the company's policies towards customers going on without the knowledge of the management.

The stockholders, too, afford an opportunity for the spreading of information as to the fairness of the company, its desire to render the best service, its importance to the life of commerce and industry in the community, and such other information as may increase the value of a property by favorably advertising it and creating public favor toward it.

But no results from this avenue for favorable publicity can be expected unless it is properly organized, and by a long process of patient education, stockholders are shown that their active co-operation is desired, and furthermore, are shown how they can best be of service to the company. Much of the annoyance and embarrassment of companies, due to the fact that politicians firmly believe that corporation baiting is popular, would be choked off, and if the politicians or newspaper editors from whom they get their cue were, on the issuance of unfair criticism of deserving local enterprise, to receive a shower of communications, or even an occasional word of mouth quietly spoken, there would be established a doubt in their minds as to whether or not the chord on which they were playing was so popular.

Suppose, for instance, that 5% of the 200,000 public utility stockholders in Illinois should write a

state representative, mayor or an editor advising him upon the occasion of his making an unfair statement that either he was misinformed or grossly unfair and that he was treading on the toes of a very large number of worthy citizens who were supporting the community by the taxes they pay, would it not have a very prompt effect? Merely to convince the average politician that 80% of the owners of $1,000,000,000 worth of securities of Illinois utility companies live within the state, principally in the communities served, and that most of them were people of small means, employes, savings banks, insurance companies and the like, would probably have the effect of making him very careful how he attacked such properties.

It does not seem impossible to build up and maintain in the minds of the utility stockholders of this state a knowledge of how they may help their own interests, as well as the interests of the community, to such an extent that 5% of them would promptly come to the front when any movement calculated to injure their interests was about to be promulgated.

Increasing the Number of Stockholders.

In this connection, the desirability of increasing the number of owners should not be overlooked. A public utility cannot have too large an ownership among the people of the community it serves. If it were possible that every customer could be a shareholder it would be most desirable. A prominent member of one of the utility commissions has said: "If you want to increase the popularity of private ownership increase the number of private owners." As an investment, what is more logical than the ownership of an interest in the public utility which serves the community in which you live? The tendency of investors, particularly new investors, too frequently is to invest in projects located far away. Distance seems to lend glamour. Too many people are skeptical of enterprises with which they come in daily contact.

Experienced investors are more and more given to the investment of money in places where their own personality and influence will be a factor in the prosperity of the project in which they invest. This thought should be in the minds of the small investor and he should carry out this policy. The public utilities of the country are enterprises which must exist for the good of all. There is not one, however high may be the cost of the service, where, if the utility did not exist, the citizen could render himself the same service and thereby conserve his time, strength, convenience and money except at a cost many times the charge made by the utility. Therefore, what is more logical than that the people joining together with their fellows in a community should own these utilities, than which there is nothing more safe, because the company's income is based on a service which is necessary to the welfare and existence of the people, and in connection with which each stockholder's influence, however small, may be used to the advantage of the property in which his money is invested.

Utility Securities for Small Investors.

Many utilites have made great progress in the wide distribution of their securities among the people of the communities in which they operate, but the possibilities are so great that the surface has hardly been scratched. Any company not vigorously exerting itself in this direction at the present time is neglecting, to the serious hurt of itself, the greatest opportunity which public service utilities have yet had a chance to take advantage of. There is a very wide distribution of wealth in this country—there is a lack of safe and suitable investments. With the letting down of the demand of our government to borrow money, the people who would be thrifty and save must find some other form of investment. The young man or young woman who, as a result of patriotically subscribing for the government loans, has learned to save and the fascination and satisfaction of owning securities will find some other place to put his or her money, and there is no better place than in the securities of a well-managed utility serving the community in which the young man or woman lives. Under the natural order of things the purchase of a share or two of stock by an embryo investor in a certain company will pledge him to this security as his favorite.

In the sale of these securities the services of the employes should be utilized. There is nothing which will equip the employe with information and give him faith in the soundness, integrity and progressiveness of his company like the acquirement of the information which he must have in order to explain to his neighbors and friends the workings of his company, the corporate structure, the property owned and the value of its securities, and what employe can go out and sell the company's securities and not be a booster for the company?

Good Will of the Press Important.

In the activities directed toward the public the approval of the press and such publications as circulate in the community is of great importance. The press is the natural medium to reach the people. As merchandisers of news the press is generally found to be fair and anxious to print information which will be interesting to its readers.

It is to the best interest of a community that the newspapers be unprejudiced, fearless and honest, and it is my belief that fundamentally a very large percentage of those who dictate the policies of the newspapers of this country are honestly trying to be all of the above in serving the best interests of their communities. But naturally they are in the newspaper business to make a living, which they cannot expect to do if they are not very active in taking up all kinds of inquiries which may lead to improvements.

There are very few newspapers in this country with which a broad-minded, fair utility manager can not work, not with any idea of squelching just and fair criticism of his properties but in an honest effort to improve the service which he is rendering to the community, and to keep the public fully informed as to matters of interest concerning the important enterprise in the community which he manages, advising it of his troubles and difficulties and the limitations which prevent the company's meeting any of the public views which from time to time spring up.

And thus you will probably reflect from the fact that so few of the utility managements are taking advantage of their opportunities in using the few mediums here referred to, that in view of the hundreds of other ways in which favorable public opinion may be cultivated, most of us have ourselves to blame if the public does not know as much as it should of our good work, our difficulties and our honest intention to render material service to them. If, lacking this information, they continue to listen to the slanderous statements of those who would advance their personal interests in such ulterior ways, then we have only ourselves to blame.

Electric Versus Hydraulic Drive for Steel-Mill Auxiliaries

Factors Affecting Choice of Equipment — Characteristics of Drives for Different Applications—Relative Costs—Paper Before Iron and Steel Engineers

By R. B. GERHARDT

Sparrows Point Plant, Bethlehem Steel Co.

CLIMATIC conditions as to atmospheric temperature variations affect selection to a very considerable extent. It is very desirable to eliminate all hydraulic power possible where mills are located in very cold climates or where it is not possible to protect a piece of apparatus from severe cold weather. Where a hydraulic system is already installed and hydraulic power is available, it is often more preferable, when considering an additional piece of apparatus which is considerably simplified by driving from a piston and cylinder, to hold to the hydraulic drive. Often good judgment dictates that an electric driven hydraulic plant for taking care of auxiliaries which are considerably simplified with hydraulic rather than with electric drive, is the best installation; as in the case of large bloom or slab shears which would require a flywheel motor-generator set and special driving motor if electric drive were used.

Location and Control.—From the control standpoint the electric drive almost always has an advantage over the hydraulic drive, for the electric controller is usually a more convenient piece of apparatus for an operator to handle than a hydraulic valve, and for adaptability to location it has a decided advantage over the valve.

The distance of the piece of apparatus under consideration from the hydraulic supply mains is quite a factor in making a selection between the two types of drive, as it is very costly to transmit hydraulic power any distance due to expensive piping, loss of power due to friction, and liability to leaks. On the other hand, such distance is no item whatever with electric transmission. The expense of operating a hydraulic system is very high if constant vigilance is not maintained to avoid leaks and to keep dirt and grit out of the water in the system.

Adaptability to Specific Equipment.—The main difference between the two kinds of power under consideration is that one more readily is transferred into a reciprocating motion and the other into a rotary motion. Considering two drives, one hydraulic and the other electric, for operating a certain piece of apparatus having a straight line motion, if the hydraulic engine and the electric motor were built under the same specifications as to capacity and ultimate speed of the apparatus they drive, without the specifications having outlined a complete duty cycle, the probable result would be that the speed of acceleration of the two equipments would be somewhat different for the following reason: with the electric motor drive the torque developed in the motor has considerable work to do in overcoming the inertia of the motor armature and other rotating members of the drive, while the force acting on the piston of a hydraulic drive usually has fewer parts to accelerate and considerable less inertia to overcome. The control of each equipment is a factor in the time of acceleration, since with the electric motor the torque is proportional to the current and the controller regulates the current to the motor; while with the hydraulic equipment the control valve admitting the water regulates the quantity of flow to the cylinder which affects the force acting on the piston. It should be pointed out in the one case the feature limiting the torque which can be developed by the motor is the mechanical and electrical limits of the machine itself, while in the other case the pressure on the hydraulic system limits the force available for doing work.

Efficiency.—With regard to efficiency, the electric drive has an advantage over the hydraulic drive. Pressure engines are very efficient at full load, but their efficiency decreases as the load decreases. With the electric motor the efficiency varies but slightly between wide limits of load.

Considering then each of the particular auxiliaries before mentioned which under present day practice are being installed with either method of drice, we arrive at the following detailed conclusions:

Furnace Door Hoists.

The operating mechanism for a furnace door is usually quite simple when hydraulic power is used. A cylinder and piston is supported above or behind the furnace for each door, and the door is handled by this piston through chain or cable which passes over a sheave attached to the furnace directly over the door. When electric power is used the cylinder and piston are replaced by electric motor, connected with suitable gearing to a crank which has a throw equal to the maximum lift of the door. Sometimes a special motor-driven drum is used instead of the crank as in the case of the electric door hoist. With the electric drive the door is usually counterweighted. In cases where the control for a great number of furnace doors is grouped in a pulpit, the electric drive has a decided advantage. Sometimes an electric operated valve is used with a hydraulic drive when this pulpit control is desired.

Table I gives a comparison between hydraulic and electric drive for a heating furnace door.

TABLE I—FURNACE DOOR HOISTS.

	Hydraulic.	Electric.
Initial cost	$703.00	$2009.00
Power per year	4.40	5.15
Maintenance and repair (labor)	93.60	10.40
Cost per year (material)	62.40	20.80
Depreciation and interest	70.30	200.90
Total expense per year	230.70	237.25

Furnace Covers.

The apparatus for handling a furnace cover is in a great many respects similar to the furnace door hoist except that in this case a motion of translation is required instead of a raising and lowering motion. The soaking pit furnace cover is usually carried on wheels and made to traverse back and forth over the furnace by means of a hydraulic cylinder anchored to the furnace at one end and connected through piston and a long rod to the cover. When the electric drive is used the cylinder is replaced by a motor and suitable gearing, meshing into a long rack which is attached to the cover. Sometimes the electric motor drives a long rod, attached to the cover, back and forth through a suitable friction, and in this way one motor can be used to handle more than one furnace cover.

The points as to convenience of control hold the same in this case as with the furnace door.

TABLE II—FURNACE COVERS.

	Hydraulic.	Electric.
Initial cost	$4020.00	$8150.00
Power per year	11.75	9.36
Maintenance and repair (labor)	105.00	24.00
Cost per year (material)	83.20	46.80
Depreciation and interest	402.00	815.00
Total expense per year	601.95	895.16

Elevators.

The elevator used in the steel mill very closely resembles the general freight elevator used in commercial work.

Table III gives data on each type of elevator for a particular installation.

TABLE III—ELEVATORS.

	Hydraulic.	Electric.
Initial cost	$41,000.00	$22,000.00
Power per year	1,944.00	691.20
Maintenance and repair (labor)	434.00	425.00
Cost per year (material)	890.00	720.00
Depreciation and interest	4,100.00	2,200.00
Total expense per year	7,368.00	4,036.20

Blooming Mill Manipulator.

The side guard manipulator for handling and turning steel during the rolling process in the blooming mill is at the present time the manipulator most commonly used. Essentially it consists of two long heavy steel plates carried vertically on edge directly over the mill live table rollers, one toward either side of the table. These plates are supported from independent movable beams located underneath the table, by means of arms extending up between the table rollers. The beams, of which there are usually two to each plate or guard, are carried on guide rollers and attached at the ends to hydraulic pistons, or through suitable rack and pinion to electric motors, which actuate the plate or guard back and forth in a direction parallel to the axis of the table roller. A piece of steel on the table can be caught between the two side guards and carried back and forth across the rollers to any desired position. To turn the piece, fingers are provided, which work vertically up and down just inside one of the guards. These fingers are carried with the guard on suitable supports and by means of a separate cylinder and piston; or electric motor and crank mechanism, acting through a lever, shaft, and bell cranks, receive the vertical motion mentioned.

Table IV gives a comparison between two such drives for a particular manipulator:

TABLE IV—SIDE GUARD MANIPULATOR DRIVE.

	Hydraulic.	Electric.
Initial cost	$22,566.00	$23,850.00
Power cost per year	2,308.80	898.56
Maintenance and repair (labor)	220.80	93.60
Cost per year (material)	271.00	145.20
Depreciation and interest	2,256.60	2,385.00
Total expense per year	5,057.20	3,522.36

Lifting Tables and Middle Roll Balance.

These two mechanisms are usually considered together on a three-high plate mill and will be so considered in this comparison. Essentially the hydraulic lifting table mechanism consists of a cylinder located under the table, having a piston and rod connected through a link to a suitable system of bell cranks which actuate the table vertically up and down according as the piston is forced into or out of the cylinder. With the electric driven lifting table the motor drives through reduction gearing to a crankshaft which through a connecting rod actuates the bell cranks above referred to. In each case the tables are usually counterweighed. The hydraulic middle roll balancing mechanism consists of cylinders carried on the mill housings, the pistons of which transmit a vertical motion through the rods to heavy link members connected at the lower ends to centers of beams which are attached through rods at one end to the mill housing in such a way as to give a straight line motion to the other ends which carry the middle roll. With an electric drive the motor is connected through reduction gearing to a crank shaft which imparts a vertical motion to heavy hollow weights open at the bottom, by suitable connection through rod, shaft, and bell cranks. These weights telescope over other weights pinned to one end of walking beams which are supported at their center on trunnions carried on pedestals under the mill housings. To the other ends of these beams are pinned yokes each carrying two vertical rods which support at the tops a shoe carrying the middle roll. Ordinarily the middle roll overbalances the weight on the end of the walking beams and stays in its lower position, but when the telescope weight is lowered on the top of this weight the balance is overcome and the middle roll rises to its top position. To prevent a severe shock when this telescope weight is lifted through the gearing, crank shaft, and levers, it is supported by a heavy spiral spring interposed between a rod carrying the weight and the actuating lever.

Table V gives data on the two methods of drive for a particular mill.

TABLE V—LIFTING TABLE AND MIDDLE ROLL BALANCE.

	Hydraulic.	Electric.
Initial cost	$36,370.00	$41,600.00
Power per year	14,030.64	3,895.00
Maintenance and repair (labor)	588.72	285.60
Cost per year (material)	787.20	518.40
Depreciation and interest	3,637.00	4,160.00
Total expense per year	19,043.56	8,859.00

Shears.

A hydraulic shear is probably the simplest piece of hydraulic machinery in the mill. It usually consists of a heavy frame carrying at one end in a suitable housing a knife blade, and at the other end a cylinder. The piston carries the other knife blade and works in and out of this cylinder producing a shearing action between the blades. Hydraulic shears are usually build up-cut or down-cut. The particular shear selected for this comparison is one of the latest design using a steam intensifier for securing pressure for the cutting

stroke. With this arrangement there are two distinct hydraulic systems used, one a closed system directly between the cutting cylinder and the intensifier, and the other the regular mill system connected through suitable valves to cylinder for the return stroke. By using the steam intensifier greater economy is gained, as the expansive power of the steam is utilized also; it is possible to get up to working pressures of 6000 lbs. per sq. in.

The electric driven shear requires a considerably heavier frame casting. The lower shear blade is held stationary in this frame and upper shear blade receives its motion through either a crank, eccentric, or cam action. The driving motor is geared through countershafting to this crank, and a heavy flywheel is mounted on the countershaft. Usually the motor and flywheel are allowed to run continuously, the shear being operated by throwing in a clutch on the countershaft. More recently, on account of trouble encountered with such a clutch, the flywheel has been omitted and the motor geared directly to the shear, the motor being started and stopped in this case with each cut of the shear. Such a design of motor-driven shear is the one considered in the following calculations.

Table VI gives data on the two types of drive for a particular bloom shear application.

TABLE VI—SHEARS.

	Hydraulic.	Electric.
Initial cost	$22,640.00	$39,600.00
Power per year	5,723.47	4,310.70
Maintenance and repair (labor)	328.00	135.60
Cost per year (material)	385.76	334.00
Depreciation and interest	2,264.00	3,960.00
Total expense per year	8,701.23	8,740.30

SUMMARY.

With each of the foregoing comparisons, in the case of the initial cost of the hydraulic drive the proportional cost of an electric driven hydraulic pumping station is included.

The fixed charges are always one of the main items of expense, and this is taken in all cases as being 10% of the initial cost. Except in the case of the furnace door and cover drives the item of power is highest or second highest. The cost of a unit of electrical energy was taken as being 1 cent per kw-hr.

To obtain the cost of power with hydraulic drive a test was conducted on the pumping plant which consists of three 7½-in. by 24-in. horizontal, duplex, end-packed, plunger pumps, each direct-connected through reduction gearing to a 350-hp., a-c. slip-ring motor. An automatic governor is arranged to start and stop the motors one at a time, depending on the demands on the hydraulic system. By means of a large accumulator located outside of the pump house the pressure is maintained constant at approximately 750 lbs. The results of the test mentioned show a power consumption of 8 watt-hours per gallon of water pumped.

Under maintenance and repair costs are considered: with the hydraulic drive, cylinder and rod packing replacements, cup leather and valve renewals, and lubrication; with the electric drive, controller repairs and contact renewals, motor brush and pinion renewals, and lubrication.

It should also be remembered that the prices here shown do not hold good in general, as they are all war prices and cover a particular installation at a certain location. The figures are only given for the purpose of making a comparison.

Reviewing each of the tables the author draws the following conclusions: In the case of the furnace door hoists the expense of operation is about the same with hydraulic or electric drive. The initial cost of the electric drive is almost three times that of the hydraulic drive. With the furnace cover drives the advantage as to expense of operation and initial cost lies with the hydraulic drive. Ease of control has a decided advantage in the case of the electric drive, and the hydraulic furnace covers for a large mill might require more operators than electric covers, in which event the expense of one additional operator would more than offset saving indicated with the hydraulic drive.

The electric driven elevator has an advantage over a hydraulic elevator in both operating expense and initial cost.

For driving the side guard manipulator the electric motor has an advantage over the hydraulic cylinder in operating expense, and the initial cost of either drive is about the same.

The electric drive for lifting table and middle roll balance on a three-high plate mill costs considerably more than hydraulic drive, but has a decided advantage over the hydraulic in operation expense.

There is comparatively no difference in the cost of operation between an electric driven and a hydraulic bloom shear, but the initial cost of the electric drive is considerably higher than that of the hydraulic drive.

There is probably very little difference between the reliability of the hydraulic drive and that of the electric drive in each of the above mentioned applications however.

The hydraulic field covering large power presses and forges has not, up to the present time, ever been invaded by the electric motor, but this does not necessarily mean that the electric drive cannot be adapted to do this work. More than likely it is the prohibitive cost which has kept the electric motor out of consideration. The motor-driven intensifier, before mentioned, is the entering wedge for the electric drive in this field.

NEW HYDROELECTRIC PLANT NEAR WINNIPEG, MAN.

One of the largest hydroelectric plants in America is to be built at Little du Bonnet falls, on the Winnipeg river, near Winnipeg. It is proposed to expend $9,000,000 on the work and the expectation is that 160,000 hp. will be developed. The first step in the project will be the building of a concrete dam 2000 ft. long and of a maximum height of 70 ft. across the Winnipeg river at Little du Bonnet falls. The dam will create a reservoir from 50 to 70 ft. in depth, extending several miles up the river to the second McArthur falls, and, by raising the river's level will drown out Grand du Bonnet falls, where the river drops 35 ft. in four plunges. Eight turbines of 21,000 hp. each, of four-runner, horizontal shaft type, will be installed in pits in the concrete substructure. The water from the reservoir will pass directly into the turbines at 20,000 cu. ft. per sec. The power generated at the plant will be transmitted to Winnipeg by a double-circuit line supported on structural towers 54 ft. high. A second double-circuit line will connect the power house with the power plant at the Winnipeg Electric Railway at Pinawa higher up the river. A double-loop connection will thus be maintained between the city and the source of power.

FIFTIETH ANNIVERSARY OF THE WESTERN ELECTRIC COMPANY.

From Extremely Modest Beginnings in 1869 the Company Has Grown to Be One of the Largest Electrical Manufacturers in the World.

Half a century of continuous existence is no new thing in American business, but the significance of such a life in the electrical industry is indeed great because, properly speaking, the electrical industry belongs to the present generation of men.

In November of this year the Western Electric Co. celebrates the fiftieth anniversary of its birth. It began in 1869 as a small two-man concern, founded by Elisha Gray and Enos M. Barton. The firm was known as Gray & Barton.

As the telegraph was practically the only application of electricity which had been brought into any considerable commercial use in 1869, undertaking to manufacture electrical apparatus required not only vision but indomitable faith and energy together with sound business sense. Mr. Barton had these qualities and sensed the opportunity which was offered when he took over the Cleveland shop which the Western Union Telegraph Co. had decided to abandon. Soon after the new concern moved to Chicago.

Before the day of the telephone the little shop manufactured telegraph apparatus, signal boxes, registers, annunciators, call boxes and fire-alarm apparatus. After the advent of the telephone in 1875 the company was busy making equipment for the exchanges of the Western Union Telegraph Co. In 1879 the retirement of the Western Union from that field gave the control to the American Bell Telephone Co. This company had hitherto purchased its telephones from competitive manufacturers, but, recognizing the superiority of the equipment made for the Western Union, it entered into a contract with the Western Electric Co. which provided that the latter should make all the telephones for the American Bell's use.

The needs of this service quickened the inventive genius of the company's engineers and brought a corresponding and ever increasing expansion of its volume of business.

The common-battery lamp switchboard of today was evolved from the crude switchboard of the early seventies, the attractive desk stand telephone from the cumbersome box type. The paper-insulated lead-covered cable solved the problem of the necessary increase in the number of open wires as telephone service became popular, and the establishment of transcontinental wire communication and transoceanic wireless communication solved the problem of long-distance transmission. In the telegraph field the multiplex printer is an achievement of the Western Electric engineers in co-operation with others.

To meet an ever increasing demand for products which it did not make, the company bought such goods of the makers and resold them to the user. Out of this early relationship of buyer and seller has evolved the largest electrical jobbing organization in the world, operating from 42 distributing houses. These houses perform a two-fold function. By virtue of the supply contracts with the American Telephone & Telegraph Co. and associated companies, they supply all the apparatus and supplies for these companies, thus effecting tremendous economies as a result of being able to purchase greater quantities than each individual company could.

Further than this, each distributing house maintains large stocks of materials and electrical appliances for every possible electrical need. It is prepared to supply materials for building pole lines; for equipping and wiring homes, offices and factories, and for supplying electrical appliances for simplifying housework.

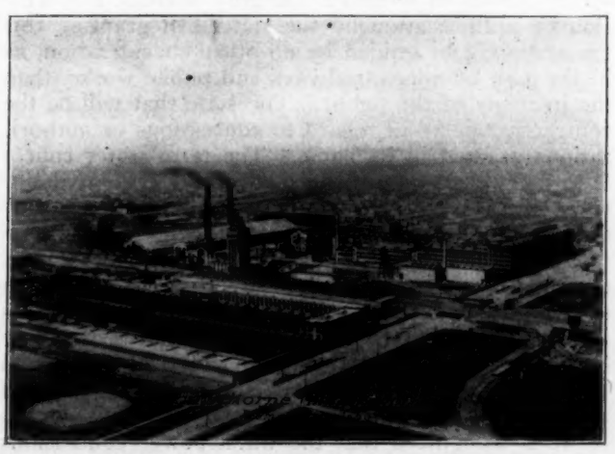
The company also maintains a large manufacturing plant built at Hawthorne, at the city limits of Chicago, Ill., in 1903. This plant is constantly being enlarged to meet the fast increasing needs of the telephone manufacturing end of the business. The employes of this plant, together with those from the 42 branch houses in the United States and the foreign houses, constitute a working force of over 30,000 men and women.

The telephone was an American invention and to the Western Electric Co. belongs the credit for having the foresight in 1879 to lay the foundations for an enduring business in foreign lands.

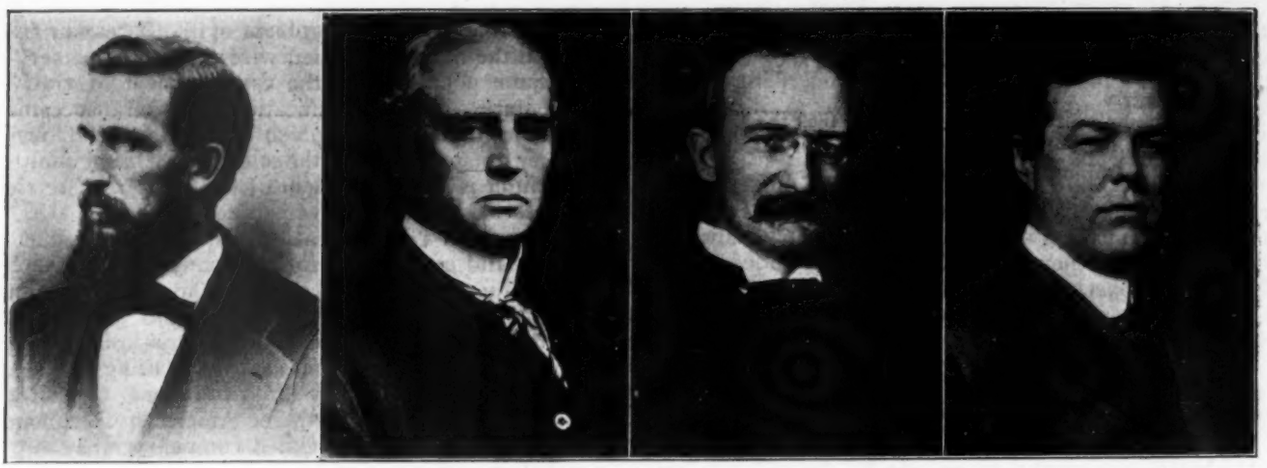
At the present time it has associated companies in Belgium, Switzerland, Argentine, Norway, South Africa, England, Italy, France, Australia, Japan and Holland, and allied companies in China, Russia, Austria and Hungary.

The Western Electric Co. played a prominent part in the World War. It has been said by experts that the American Army could not have functioned without the modern telephone system which was built in

Building on Kinzie Street, Chicago, Where the Company Established Its First Plant, Shortly After Organization of the Business in 1869 by Gray & Barton.



Hawthorne Works of the Western Electric Co.—This Is Now the Principal Plant of the Company and One of the Largest Electrical Works in the World.



Successive Executives of the Western Electric Co. During Its 50 Years.

Elisha Gray,	Enos M. Barton,	H. B. Thayer,	C. G. Du Bois,
President, 1869-1887.	President, 1887-1908.	President, 1908-Dec., 1918.	Became President in 1919.

France between the front line and the seacoast. The multiplex printing telegraph was put to the test in handling the armies of the Allies. In the air, the company did notable work in the development of radiotelephone equipment, particularly as applied to communication between airplanes and the earth, while on sea, in addition to the great practical utility of the radiotelephone from ships to the land, and from ships to each other, the submarine detecting equipment as developed by engineers both here and abroad undoubtedly was an important factor in defeating the submarine peril.

Apparatus was likewise developed for use in the locating of enemy artillery fire, and equipment for use in the listening posts in advance of the lines.

In addition to its work on telephone apparatus, the company was able to serve the Government in conspicuous fashion by assembling and shipping to the other side large quantities of electrical supplies of every character.

At the same time the foreign allied houses manufactured large quantities of equipment which were used by the allied armies.

NEW FRENCH WATER-POWER LAW.

The new law on water power in France provides that no one may use the power of the tides or of the water courses of whatever category without a concession or authorization by the state. In granting this the state will be guided by no other consideration, as in the case of mines, railways and public works, than the interests of the public. The state that will be the contracting party in regard to concessions or authorizations granted in its name. The term water course is to include all natural or artificial waters, canals, or rivers, and even the mountain lakes which are frequently sources of energy.

While including within its discretion the use of the tides, the new law recognizes that the utilization of the varying levels of sea water as power generators is far from being efficient; in fact, that it has only been approached theoretically, no practical application thereof having yet been established. It is capable of subsequent development.

It is recognized that the water-power concessions will be made to great and small concerns; and in regard to the latter the new law embodies a novel idea. The factories that furnish current for the illumination of villages are often very small, and use only a few horsepower. In the basin of the Seine, for example, in 1910 there were 149 factories for community lighting, of which 36 possessed the normal power of 2 to 10 hp., 43 of 11 to 20 hp., 23 of 21 to 30 hp., 13 of 31 to 40 hp., and eight of 41 to 50 hp.

It appeared to the framers of the law that the state should not make its intervention too direct in these small concerns where such might become vexatious, and that the state need not in these cases exact certain costly formalities. The state proposes, therefore, to leave the law now in existence, as it is for concerns of which the maximum power does not exceed 50 kw., the effect of which provision would be to enable little factories, not using over 30 to 35 hp., to neglect concession formalities. The second category includes factories of a maximum power of over 500 kw. for whatever purpose.

PROPOSED RAILWAY ELECTRIFICATION IN FOREIGN COUNTRIES.

European and South American countries, with the exception of England alone, lack an adequate supply of fuel, but many of them, including Norway, Sweden, Switzerland, Italy, Spain and Brazil, have large amounts of water power, while France has a moderate amount. These resources, combined with the high cost of fuel, make extensive railroad electrification in these countries inevitable sooner or later. Switzerland has a well established program covering a term of years, while both Norway and Sweden are giving active consideration to definite projects. In England a considerable amount of electrification is in contemplation along with the general plan for the electrification of industry. A French commission, composed of government and railroad engineers, has already visited the United States in order to thoroughly familiarize themselves with American practice. The Italian government will continue its definite program as soon as financial conditions permit. An official Belgian commission is already planning to rehabilitate with electric power at least a portion of the railroads destroyed during the war. In Spain, Brazil and South Africa as well, railroad electrification is under active consideration.

Editorial Comment

The Coal Miners' Strike

AS WE go to press, it seems that no assembly of forces can be marshalled to avert the impending bituminous coal miners' strike. The public will again suffer heavily as the "innocent bystander." And in the individual sense it probably will be more concerned with the inconveniences caused than with the merits of either factor in the controversy.

As customary in public calamities of this character, curative treatment will overshadow the preventative. As we are being drawn into this thing, which should never occur in this great, rich country of ours, government officials are perfecting a program to meet the situation. This program, besides including steps to break the strike, will provide means to revive the Fuel Administration, to prevent hoarding and profiteering, to re-establish maximum prices, and to allocate and distribute coal to homes, railroad and essential industries.

The question that every central station faces is how long will the supplies of coal available suffice? This in turn depends upon how long the strike lasts or how long is required for conditions to settle down to those of one month ago. In circumstances such as these conservation is sound. Coal must be conserved in every way feasible. What is feasible depends upon the strike situation during the days to come. The central station must be prepared for the worst.

The present high price of coal causes operating economies to be quite generally maintained. Little therefore can be done now in this connection to save coal. Every little helps and every little that can be done should be done, should have been done long ago. If the rate of coal consumption is to be lowered appreciably it will be necessary to accomplish this not by only increasing the efficiency a small percentage, but also by curtailing load. Deciding just where load should be curtailed—bearing in mind that such is an emergency measure only—is not an easy matter, because there are so many aspects to the problem—financial, technical, commercial and legal.

If a coal shortage seriously threatens conditions will rapidly assume those existing during the worst period of the war. The revived Fuel Administration or similar agency will doubtless adopt the same effective tactics followed in those days of lightless nights, heatless Mondays and when the absolutely non-essential industries were closed down. The central stations can follow tactics similar to these upon their own initiative and according to the seriousness of their depleted coal supplies.

Dark days may be ahead, literally and figuratively speaking. We do not know. But we do know that once again has been brought home to everyone the wisdom of having coal stored away. Not long ago we said in these columns that the time to store coal was then. The days to come will prove that advice both sound and wise, for if needed the coal is there.

Without coal supply, manufacturing dwindles and transportation stops. Production is one of the crying needs today. Without coal the world shivers, sickens and starves. Coal is a vital, indispensable thing—the foundation of comfort, of industry, of modern civilization. It is a sad weakness of our industrial system that controversies over the remuneration or other details of employment cannot yet be settled amicably and with reason instead of resorting to stoppage of work, often involving violence, and thus depriving the public of one of the most vital necessities of modern life. The collapse of the national industrial conference, upon which everyone looked to help solve this problem, has therefore left the country at the mercy of the contending industrial factions.

The A. I. E. E. Publication Policy

THROUGH its Board of Directors, the American Institute of Electrical Engineers has launched a radical change in its policy respecting the publications it issues. Heretofore the monthly *Proceedings* and the annual *Transactions* have been issued at considerable expense out of the general funds of the Institute and in the last few years this expense has quite materially increased, as has that of all publishers without exception. Consequently the issuance of the publications has become more and more of a burden on the general resources of the Institute. Among the recommendations made a few months ago by the Development Committee, which was charged with making a thorough investigation of Institute affairs to the end that means be found for making the organization more valuable to the membership at large, was that a policy be adopted which would make the Institute's publications, especially its monthly, of much more value to the members than at present and yet make them self-sustaining and no longer a burden on the general resources.

A similar problem was presented to the American Society of Mechanical Engineers a year or so ago and it was solved by greatly expanding its monthly *Journal,* the expense thereby involved being met by taking on a great deal more advertising than before. It is reported that the enlargement of the *Journal* has not only proven very popular with the membership of that society, but that its advertising income has made it entirely self-sustaining.

In view of the evident success of this sister so-

ciety's changed publication policy, it was but natural that the A. I. E. E. should follow this precedent. This has now been done. The action comes after considerable discussion and after quite a few members raised their protest against a national technical society falling back upon commercial support to relieve the membership from sharing equitably in meeting the increased costs of operation. Similar protest was made in the A. S. M. E. against thus lowering the society's ethics.

However, the majority rules and the only question remaining is to put through the new policy without further lowering of the dignity and standing of the Institute. If the income from advertising is put back entirely into the publication fund, but few will find fault. While the caution may not be needed, it should be emphasized that any attempt to use this income for the general needs of the Institute would immediately open it to the charge that it is no longer conducted "not for profit."

Minimizing Noise and Vibration in Substation Buildings

ECONOMY of investment in conductors and economy in operation because of line losses, as well as good voltage regulation, all favor the location of substations at the center of gravity of the load, present or prospective, as the case may be. As the result many substations are built in residential or commercial districts, where the population is comparatively dense and housings somewhat congested. Apparatus so located, whether for supplying power and lighting or street railways, should operate as noiselessly as is practically feasible.

Litigation has occurred in the past, although it must be said the cases are few and far between, because some property owner or some tenant has claimed damage was being done him on account of vibration or noise, these two either singly or combined being claimed to be giving rise to injurious effects. Apart from this aspect of the matter, which embraces matters of public policy and relations, electrical apparatus that must from necessity or from choice be located in residential districts especially, or anywhere else for that matter, should make a minimum of noise and commotion.

The manufacturers have done quite a lot toward making both static and rotating electrical apparatus operate more or less noiselessly. They have reduced vibration and noise due to loose laminations and the rattling of parts. They have very largely reduced humming at pole tips and air gaps due to high flux density and hysteresis loss. They have minimized whistling and singing due to windage. All these are influenced by design and all are contributing factors that go to make up the elusive but nevertheless very real "stray loss," so whatever is done to reduce noise and vibration is a movement in the direction of higher efficiency.

However, while the onus for making electrical apparatus noiseless may devolve upon the manufacturer, and whether apparatus is relatively noiseless is very largely a matter of unit cost—how much the purchaser is willing to pay for silent operation—the operator of equipment is not altogether lacking in opportunity to decrease noise. By proper installation, noisy apparatus may be so installed that noise and vibration are restricted instead of magnified, concentrated and dissipated instead of distributed. In other words, the method in which noisy apparatus is installed and the type of structure in which it is housed may be factors that decide whether certain apparatus is to make a noise that is objectionable or whether that same noise shall be unobjectionable. The responsibility for this rests with those concerned with the substation building and the installation of the equipment in it.

While the conditions to be met by the designer of the electrical apparatus may be complex, those encountered by the architect and construction engineer are comparatively simple and, in the main, self-evident. Windows, and especially needless windows, should be omitted from the substation walls to reduce the transmission of noise. What windows are used should be located so as not to be in direct path of air currents upon which noise is carried away. Walls should, where possible, be built with air spaces to form a cushion which will impede the passage of direct noise. The foundations for apparatus should be isolated and distinct from the walls of the station, thereby reducing the transmission of both vibration and noise. Where forced ventilation is employed the ventilating system should be so arranged that it does not act as a duct for air-borne noises to the outside of the building. These are all conditions that can be met by the architect once he appreciates the situation.

More specialized are those cases where forced ventilation is employed and where machines are totally inclosed either for purposes of shutting in noise or carrying away thermal losses; pads can be installed underneath transformers and induction regulators; soundproof rooms often are the indicated solution. These are matters for the electrical and construction engineers rather than the architect.

It may be pointed out that whereas the construction engineer can fairly readily adopt measures during and subsequent to the time equipment is installed to reduce existing noise and vibration, the architect must make his plans well in advance, since it is usually too late when a structure is erected to then commence to isolate foundations, build partitioned walls and change the location of windows. The moral from this is, of course, to familiarize the architect thoroughly with the problem of reducing noise and vibration from electrical apparatus and co-operate that the end may be eventually attained by prevention rather than eradication.

Current Events

Steinmetz on Power Supply — Radio Interests Combine — A.I.E.E. Publication Enlarged—Illinois Association Meets

STEINMETZ' CHICAGO LECTURE TELLS OF FUTURE POWER SUPPLY.

Crowded Joint Meeting Listens to Famous Engineer's Discussion of Power Supply and Generation.

On Oct. 29 Dr. C. P. Steinmetz, of Schenectady, N. Y., gave his annual lecture before the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers when he addressed an overflow meeting at the Art Institute, Chicago, on "Power Supply and Generation of the Future."

In his typical manner Dr. Steinmetz first took up the question of what is the meaning of energy supply. There are two entities essential to the civilization of today. One of these is materials, the other energy. It is the characteristic of the age that these materials come not from the immediate vicinity where we use them, but they come from a distance. Where once a man produced his own leather and made his own shoes, today he purchases them or at best produces only one small part of the whole. This means that transportation by railroads, steamships, etc., is a vital factor in the civilization of today. Transportation is in part responsible for the high state of civilization as it is found now.

Energy is the ability to "do." It is energy in some form that transports the materials, as by trolley, by locomotive and truck. Just as our existence depends upon materials, so it depends also upon energy. It is essential if we are not to cease to see when night comes, it is required to create heat to keep us warm and to aid our limited muscular power. The question is how to obtain energy and how to supply it? It is very largely a matter of systematized transportation of materials.

Dr. Steinmetz then discussed the difference between energy and power, explaining that power is the rate of doing work. Lightning strokes are over in a fraction of a second; their power is enormous, their energy extremely small. Energy, like matter or materials, cannot be destroyed, but only converted or transformed into some other form. In obtaining this essential energy, man has called upon nature's most readily convertible sources of energy—coal (including oil and gas) and water power. The energy in these materials must be transported from where it is found in the raw state or material state to where it is to be used. This brings up the problem of transporting energy and converting that energy from a nonusable form or form not wanted to the form in which it is wanted.

Of the two forms of energy that may be transmitted, chemical and electrical, chemical energy for secondary distribution is excluded. For general distribution only electrical energy is available. It is electricity that makes the widespread supply of energy to civilization possible for any and every purpose. By a network of transmission lines the large industrial plant and the small individual household can alike obtain energy whether it be for operating the huge steel mill, for making steel, aluminum and carborundum or for operating the fractional-horsepower motor in the home.

In the early days electricity was used for light, supplied by local stations. Then came power and trolleys, with power plants farther separated. Today light, heat and power utilize electrical energy as the working medium generated in large stations. Where once each man produced himself his major necessities of life, today a man specializes in some one thing. Every industry is a combination of two industries—the production of goods and the production of power. But in this age of specialization power production and distribution has become a specialized industry. The first to realize the need for and possibilities of specialized power production was Samuel Insull, of Chicago, whose power generating system is the largest in the world.

This industry of power supply is covering the country with transmission and distributing lines. Primary distribution is in large bulk at high voltage to substations. Secondary distribution is in smaller bulk at lower voltages. Systems are being interconnected, as are also stations. Much chemical energy is transported by boat and rail and is then converted to mechanical energy and then into electrical energy, then transmitted. There are some generating stations at the coal mines and these eliminate the transportation of chemical energy. There might well be more.

In this country 800,000,000 tons of coal (including the equivalent in gas and oil) are consumed annually. If a wall were built of the size of the famous Chinese wall, only using one year's coal consumption as the building material, it would encircle the entire boundaries and coasts of the United States. The energy of all this coal would be sufficient to raise such a wall 200 miles into space.

Consideration of water power as an alternative source of energy shows that even if every drop of rain were utilized the water power would amount to only about one-quarter that already obtained from coal. The potential water power due to our annual rainfall is nearly 1,000,000,000 kw-yrs. Much of this is impossible of utilization for power purposes, however, because agriculture needs much water. Allowing for the requirements of agriculture, for losses by seepage, evaporation, etc., there would be left for power production through the use of lakes, dams, etc., sufficient water to produce a maximum of about 200,000,000 kw-yrs., or about 260,000,000 hp-yrs. On the basis that one ton of coal is equivalent to one kilowatt-year, and remembering that 800,000,000 tons of coal are already consumed each year with gradual increased yearly consumption, it can be seen that there is not enough water power to replace our coal and that the idea of doing so is an idle dream.

But water power should replace coal where possi-

ble. Water power is scattered widely; often sources of power are but small. These water powers should be harnessed and their energy collected, combined and distributed. Small powers, low heads and intermittent flow mean that these stations must operate without attendants, must be automatic so as to run when and according to the water available. Induction generators that come in upon the system when water permits and function without manual supervision offer the solution to economical utilization of the small water-power plants. In the New England states alone many old power sites of 100 hp. and thereabout could be put to use through linking up to a common system.

Turning to other sources of energy, Dr. Steinmetz next spoke of energy derived from wind, one of the first sources of power to be used by man. Wind is erratic and the energy available is relatively small. But so is the flow of water sometimes, although water is less irregular than wind. Wind could be utilized by installing wind mills upon transmission-line structures. Each structure would have also its transformer which would connect the generator to the transmission line. Wind-driven generating stations might prove more economical in the desert than a coal-burning plant.

Turning then to the utilization of tides and waves, Dr. Steinmetz pointed out that the amplitude of tides varies. Using tide would be like using a piston with a stroke every six hours. Tidal energy would have to be changed to ordinary hydraulic energy, equivalent to a low-head waterfall with a changing head.

Solar energy, obtained as radiant heat from the sun, is another method of making energy available to man, a method of vast possibilities for the future, but not feasible today. While from all available water power 200,000,000 kw-yrs. might be obtained annually, and from coal at existing rates of consumption 800,000,000 kw-yrs., from solar energy 100,000,000,000 kw-yrs. could, theoretically, be obtained, or 100 times more than from coal and water combined. How this could be done economically, said Dr. Steinmetz, he would leave to the engineers of the future to say, since we must leave some problems for them to occupy their attention.

After the lecture Dr. Steinmetz for nearly an hour answered a large number of questions, embracing such matters as obtaining volcanic heat from the planet by shafts sunk into the earth, radioactivity and the energy of atoms, and divers other complex and academic aspects of the power production of the future.

RADIO CORPORATION OF AMERICA TO ABSORB AMERICAN MARCONI CO.

New Company, with Backing of General Electric, to Develop Active Competition with Cable Lines in Overseas Communication.

Plans for the establishment of a transatlantic wireless system that will compete with and not give merely a supplementary service to that of the cable companies have been announced in New York City. The Radio Corporation of America has been formed with the backing of the General Electric Co. to absorb the American Marconi Co. The plan is dependent upon the approval of the stockholders of the company.

The war, which led to a high degree of reliability in the workings of the long-distance wireless, put a pressure on means of communication which in the case of the cable lines in the Atlantic threatens to result in a permanent congestion of messages and involved temporary hindrances to the private wireless enterprise. An aftermath of war has been a demand from commercial interests that wireless facilities shall be developed on a scale commensurate with the need for means of rapid communication.

The plan of organization of the Radio Corporation of America is for an alliance of the American Marconi Co. with the General Electric Co. A substantial block of shares in the American Marconi Co. that are now held by the British Marconi Co. will be acquired by the General Electric Co. and will be part of its contribution to the capital of the Radio Corporation of America.

It is said that the new company will be exclusively American. An agreement is in negotiation with the British company by which the Radio Corporation will obtain enlarged wireless facilities abroad and new rights in the countries of South America. Because of patent agreements the operations of the American Marconi Co. have been limited to the United States and to Cuba.

The directors of the American Marconi Co. have approved the plan and appealed to stockholders to vote it into operation. A stockholders' meeting will be held Nov. 20.

It is planned to sell all the assets of the American Marconi Co. except its manufacturing plant at Aldene, N. J., and certain claims, including some against the United States Government arising from alleged illegal use of Marconi patents, to the Radio Corporation for 2,000,000 shares of common stock and preferred stock of a par value of $10,000,000. The proposal involves a 25-cent dividend on Marconi shares, payable on or about Jan. 2, 1920, and the leasing of the Aldene factory to the General Electric Co.

The plan does not involve the complete liquidation of the American Marconi Co. but does radically change the scope of its operations and relieves it of the conduct of wireless communication and the sale of wireless devices.

The capital provided by the proposed financing is believed to be ample for the fullest development of the company within its sphere. No offer of stock on the market is contemplated.

Research laboratories and the engineering force of the General Electric Co. have been at work for a number of years on radio matters. Apparatus of great value was developed and turned over to the Government during the war. The new company will have the technical assistance of the General Electric Co. and will retain the highly specialized staff of the American Marconi Co.

Edward J. Nally, who has been vice-president and general manager of the American Marconi Co., will be the first president of the Radio Corporation.

A. I. E. E. TO ENLARGE ITS MONTHLY PUBLICATION.

Board of Directors Approves Report of Special Committee on Publications—Scope of Monthly Proceedings to Be Increased.

At the last annual convention of the American Institute of Electrical Engineers the chief topic of discussion was the report of the Development Committee, one of the important suggestions of which dealt with making the Institute's publications more valuable to the membership without additional expense to the members. To further consider this matter a special committee was appointed and this reported to

the Board of Directors, at the meeting held in Philadelphia on Oct. 10, as follows:

In accordance with the resolutions adopted by the Board of Directors on August 12 relating to the report of the Committee on Development, this committee has carefully considered the Development Committee's report and the communications relating to the publications of the Institute that have been received by the president, the secretary, the Development Committee, and this committee, up to the present time.

In general, the views expressed by the membership are overwhelmingly in accord with the suggestions in the Development Committee's report, including the publication of additional matter in the *Proceedings*.

In order to best meet the needs of the membership and to promote the objects of the Institute as expressed in our constitution, namely, the advancement of the theory and practice of electrical engineering and of the allied arts and sciences and the maintenance of a high professional standing among its members, this committee recommends the following as the policy to be carried out when and as the necessary funds become available:

1. *Transactions.*—That the annual *Transactions* be continued in accordance with the long established policy, *i. e.*, with no change in size or character of contents.

2. *Proceedings.*—That the publication of a monthly periodical, heretofore designated *"Proceedings,"* be continued.

3. *Contents of Proceedings.*—(a) That high-grade engineering and theoretical papers, in full or in abstract, shall continue to constitute the major portion of the monthly periodical and that the space devoted to such papers shall be limited only by the amount of material available and the permissible expense.

(b) That the substance of discussions at Institute meetings be published.

(c) That the papers and discussions, in full or in abstract, as presented before sections and branches, be published as may be selected by the committee in charge.

(d) That a portion of the monthly publication shall be devoted to material relating to the engineering art, other than that which is presented in Institute papers and discussions, such as descriptions of new developments characterized by notable advances.

(e) That the publication of items relating to activities of the Institute and other organizations be continued and expanded.

(f) That some form of descriptive index of electrical engineering literature be published, with due regard to the various indexes now published elsewhere and the avoidance of undesirable duplication.

4. *Title of the Monthly.*—That the name of the publication be changed from *"Proceedings of the A. I. E. E."* to a title that will better indicate the broader scope of the proposed contents.

5. *Size of Monthly Publication.*—That the size of the monthly publication be increased to 9 in. by 12 in., the generally adopted standard for technical periodicals, as soon as it is found commercially practicable.

6. *Advertising.*—That the Institute's practice of the past 25 years of carrying advertisements in the monthly publication be continued and that, as heretofore, the editorial and advertising policies be entirely independent of each other.

7. *Supervision.*—That the general supervision of the monthly and annual publications, including decisions regarding the publication of articles, papers, discussions and all other matter available for publication be assigned to a standing Publication Committee, and that the carrying out of the policies that may be determined from time to time by the Board of Directors be delegated to this standing committee.

The Board of Directors approved the report and authorized the president to appoint a standing Publication Committee to formulate and carry out plans in accordance with the recommendations embodied in the report.

AUGUST ELECTRICAL EXPORTS ABOUT AVERAGE.

Substantial Recovery Shown from Preceding Month and Big Gain Over Last Year.

Electrical export figures as shown in the monthly summary of the foreign commerce of the United States for last August issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., show that a healthy recovery took place in August as compared with the relatively low total of July. The August total was also nearly 50% greater than in the corresponding month of last year. It ran just about the average of the eight months ended August 31; for that period the electrical total is reported as $62,319,616, compared with $38,611,639 for the corresponding eight months of 1918.

The following table gives the classified figures for last August and the comparative figures of August of last year.

Articles.	August 1919.	August 1918.
Batteries	$ 587,951	$ 252,529
Carbons	106,823	123,926
Dynamos or generators	586,211	258,589
Fans	53,099	29,296
Heating and cooking apparatus	124,668	79,954
Insulated wire and cables	741,443	677,485
Interior wiring supplies, including fixtures	166,499	108,386
Lamps—		
Arc	3,373	2,135
Carbon-filament	10,135	5,474
Metal-filament	350,284	203,046
Magnetos, spark plugs, etc	230,403	181,347
Meters and measuring instruments	268,448	189,393
Motors	729,603	573,547
Rheostats and controllers	45,833	17,408
Switches and accessories	356,676	159,811
Telegraph appartus, including wireless	115,645	36,858
Telephones	324,755	259,185
Transformers	441,733	554,576
All other	2,472,641	1,627,980
Total	$7,716,228	$5,340,925

Not included in the above are electric locomotives, of which there were exported during last August a total of 29, valued at $27,215.

MEETINGS HELD BY ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION.

Two meetings of the Illinois State Association of Electrical Contractors and Dealers were held Oct. 16-17 at the Coliseum, Chicago, when the Electrical Show was in progress. The first meeting was addressed by W. R. Leeper, representing the U. S. Chamber of Commerce, who outlined conditions existing in trade as a result of labor troubles, and who emphasized the necessity of co-operation in the business world in order to readjust matters satisfactorily. A round-table discussion, led by R. W. Poelma, chairman, and J. W. Collins, secretary of the association, followed. Conditions affecting the electrical industry, especially contractors and dealers, were considered.

The Friday meeting also was in the form of a round-table meeting, at which two definite policies were adopted. It was proposed that steps be taken to influence the contractor members of the association to become dealers as well in order to strengthen the merchandising power of the organization as a whole. The other policy related to improving the credit of contractors and dealers, in order that their buying powers be increased.

The meetings were attended by a large number of down-state members as well as a good representation from the Chicago district.

NEW YORK ELECTRICAL SOCIETY MEETS.

A joint meeting of the New York Electrical Society and the Metropolitan Section Society of Automotive Engineers was held at the Engineering Societies Building, New York, Oct. 29. Kingsley G. Martin, late lieutenant-colonel, Motor Transport Corps, A. E. F., addressed the meeting on "Motorization of the World's Traffic," reviewing the accomplishments of American vehicles during the war.

Illinois State Electric Association Has Profitable Meeting

Central-Station Representatives at Chicago Convention Hear and Discuss Papers on Many Subjects Vital to Industry—B. J. Denman Re-elected President

MARKED by an abundance of excellent papers and spirited discussions covering practically every subject of interest to the central-station man—from merchandising to operating—the first post-war convention of the Illinois State Electric Association, held at the La Salle Hotel, Chicago, Oct. 23-24, proved very profitable to the 150 delegates in attendance. Eleven papers were presented at the three sessions, and with the attendant discussions made an exceedingly busy and business-like meeting, from which the members gleaned a great deal of information. All papers were printed in advance of the meeting and leaders appointed for the discussion on each side. This arrangement succeeded in bringing out lively comment and amplification of the subject matter of the papers themselves.

President's Address.

In his presidential address B. J. Denman, Peoples Power Co., Moline, outlined conditions affecting the central-station industry throughout the state since the last meeting of the association. Emphasis was laid on the necessity of obtaining adequate rates to justify investment in public utilities. Central stations generally are too conservative in their attitude toward raising rates. The notion of the public that rates cannot go any other way but downward must be corrected because increased costs wrongly deemed temporary by central stations necessitate advances in rates. Maintenance of records and statistics are necessary to properly present rate cases before the Public Utilities Commission. Lack of fuel this winter will probably result in taking over numerous isolated plants by central stations, bringing up the question of extensions calling for investment which must be justified by adequate rates. In closing, President Denman said the most important work of the association had been in connection with state legislation, and he asked the co-operation of public utility interests at the coming Illinois constitutional convention.

The report of Secretary-Treasurer R. V. Prather, Springfield, indicated the extent of the work accomplished in legislative and Public Utilities Commission matters.

Presenting a Case to the Utility Commission.

Bert H. Peck, St. Louis, Mo., formerly electrical engineer, Illinois Public Utilities Commission, read a paper on "How to Present a Case to the Utilities Commission" which applied particularly to central-station companies of moderate size. Procedure in Illinois was given, and then the following advice as to fundamentals. The utility must be convinced that it has a just case or it cannot hope to convince the commission of that fact. The same arguments should be used to convince the commission as one would use in convincing himself, were he in the commission's place. It must be remembered the commission is human and may at times have difficulty overcoming prejudices incurred through neglect or abuse. Facts should be presented which the commission has by previous orders indicated worthy of consideration. All facts deemed pertinent, even including those which may be to some extent unfavorable, should be presented. Untrue statements should not be allowed to go into the record without contradiction by credible evidence to disprove them.

The discussion on this paper was led by F. A. Warfield, Illinois Traction System, Peoria, who said the advice regarding a just case was axiomatic, and that he had never heard of a utility presenting other than a just case or of a case that was not bitterly opposed on the theory that all petitions for increased rates were wrong. He advised that in presenting a case provision should be made for appeal. He thought rates should not depend on plant valuation, but if the valuation was necessary it should be based on replacement rather than on original cost or possible selling price. Variation from paths of procedure in presenting a case cause trouble and delay. It should not be taken for granted the commission is always right, but the central-station company should give all the evidence and express its own ideas as to the right and wrong of the case.

Lightning Protection.

A paper on "Lightning Protection for High-Tension Lines" was presented by A. Herz, Public Service Co. of Northern Illinois, Chicago, which gave an outline of over-voltage line conditions due to static electricity caused by lightning; it also included an outline of other causes for over-voltage. A history of the development of protective devices followed, special reference being made to the construction and operation of the horn-gap, multigap, aluminum cell and oxide film arresters, and to the practice of overbuilding the transmission line with a ground wire to afford lightning protection.

Discussing the paper, J. L. Buchanan, General Electric Co., said the growing complexity of distribution networks adds to the difficulty of affording protection against over-voltage, especially in design of an arrester which is not self-destroying. The oxide film arrester, which was brought out nearly three years ago, and in commercial use the past six months, may solve the latter problem. In his opinion the use of an overhead ground wire is good practice.

J. H. Sears, Mississippi River Power Co., Keokuk, Ia., thought the installation of an overhead ground wire a waste of money. His company operates a line that has no ground wire and also a 90-mile, 110,000-volt line that has an overhead ground wire the entire distance. There has been no perceptible difference in operation, and on the latter line the lightning discharges do not seem to prefer the ground wire to the uppermost conductor.

Harry Caldwell, Public Service Co. of Northern Illinois, Chicago, said about one-third of his company's system was built without ground wire and on this section one or two poles are shattered during a severe storm, while on other two-thirds, with ground wire, no shattering of poles is experienced.

E. H. Negley, Canton (Ill.) Gas & Electric Co., said his company had installed a bayonet on every pole on one of its lines and had more trouble with it than before the bayonets were put up. F. P. Bowen, Peoples Gas & Electric Co., Savanna, said he had the same experience, while John Leisenring, Illinois Traction System, Peoria, stated he had found bayonet installation afforded good protection against lightning.

Closing the discussion on this subject, Mr. Buchanan said the arrester could not be deemed a cure-all for lightning troubles and that the difference of opinion as to the use of a ground wire meant that the problem was different for different classes of line. Mr. Herz said it was a good plan to build a line without ground wire and later install one over sections of line on which trouble from lightning discharges developed.

Central-Station Statistics.

The uses and methods of obtaining statistics were brought out in a paper on "Value of Statistics in Central-Station Operation," presented by E. F. Fowler, Commonwealth Edison Co., Chicago. Statistics should connect up the engineering with the accounting and financial sides of the business and should deal not only with what has happened but with probable demands and tendencies. The manifold value of statistics indicates that central stations, even of moderate size, should have a department devoted to gathering them and pointing out their uses.

In the discussion, H. E. Weeks, Peoples Power Co., Rock Island, said it was regrettable smaller companies did not keep statistics because they are needed in controversies to obtain higher rates. Statistics effect economies and are necessary in arriving at operating costs.

President Denman emphasized the need of impressing a company's own employes as to their value.

S. B. Cushing, Public Service Co. of Northern Illinois, said that since so much had been done to make generation and distribution of electrical energy of high efficiency, the accounting department was a place to look to for future economies. Thus, it costs some companies 14 cts. per meter per month for billing, while others have brought this figure down to 7 cts. G. H. Lukes of the same company emphasized the value of submitting operating cost statistics to operators promptly.

Selling Goods and Service.

As a part of a symposium on the above subject, prepared by the Commonwealth Edison Co., O. R. Hogue, head lighting agent, read a paper on "Improving the Lighting Load." Obtaining new customers and educating present customers to new uses of electricity will produce increases in the lighting load. Promoting good industrial lighting, electrical signs and house-wiring are the big fields in which the central station can operate to advantage.

"Timely Power Loads" was the title of a paper by George H. Jones, power engineer. Central stations should specialize in building up load-factor by cultivating loads off-peak in character. Electric vehicles and trucks offer a big opportunity for such loads. Electric ice-making machines, steel and brass furnaces and electrochemical processes also offer excellent opportunities. Another class of off-peak service often overlooked is summer service for existing isolated plants.

Points regarding the routine of handling orders were brought out in a paper on "Modern Methods of Handling Customers' Orders," by Harold Wright, chief clerk. These were concerned with indexing of customers, receiving and entering orders, preparing and distributing copies of orders, and keeping progress reports on installations being made.

E. A. Edkins, manager of Commonwealth Edison electric shops, in his paper on "Merchandising Electrical Appliances," gave the basic principles of merchandising and then commented on such subjects as the sale of related lines of electrical accessories (like flashlights and batteries), deferred payment plans, and on specific methods of handling sales of the different kinds of appliances.

The completeness of the symposium left little room for discussion, but C. W. Johnson, Hodenpyl-Hardy Co., added a point when he said lack of building operations has been responsible for the increase in merchandising activities on the part of central stations.

John F. Gilchrist, Commonwealth Edison Co., said added impetus must be given to the commercial side of the central-station business. In the early development stage the most effort was put to the purely engineering side, but since that branch of the industry had become so efficient more effort is being made along financial, operating and merchandising lines. The answer to large merchandising sales is the deferred payment plan, which is particularly applicable to central stations selling electrical appliances because payments can be added to the monthly light bill. Low first payments will help develop a habit in customers of purchasing their electrical needs in this manner, and will stimulate many sales which would never be made otherwise.

Outdoor Substations.

"Modern High-Tension Outdoor Substations" was the title of a paper presented by H. W. Young, Chicago. He called attention to the standardization of outdoor substation equipment on the unit type basis, rendering capacity changes and repairs comparatively easy. Such equipment is simple in design and has no concealed parts carrying high voltage. The use of remote control affords protection to operators and material savings in aisle space. Comparing the performance of fused disconnecting switches with automatic oil circuit-breakers, it was stated, since the damage done to transformers during short-circuit condition is directly proportional to the energy flowing into the circuit before the transformers are disconnected, that high-tension fuses of good design will clear short-circuits in approximately 0.013 sec., or from 10 to 12 times as rapidly as an automatic oil switch, thereby affording greater protection against surges. The latter, however, can be used for switching as well as for overload protection. Also it can be closed, if in good condition, immediately after circuit interruption, while replacing fuses generally means somewhat lengthy service interruptions. Mr. Young's paper was illustrated with lantern slides showing various kinds of outdoor substations designed to meet practically any kind of service required.

The discussion was led by John Leisenring, Illinois Traction System, Peoria, and Harry Caldwell, Pub-

lic Service Co. of Northern Illinois. The former called attention to the rapid development of outdoor substations, but said, from an operating standpoint, improvements were desirable, especially those allowing for easy renewals of equipment when damaged. Former practice was to place transformers 5 or 6 ft. above ground (to keep them out of reach) necessitating heavy structures; there was no reason why transformers could not be placed at ground level on a concrete slab, and make more sightly installations. For small substations, say 500 kw. or smaller, lightning protection is important, but perhaps the oxide film arrester will solve this difficulty. Fuse protection in small stations, he said, of, say 10 kw., was not entirely satisfactory.

Mr. Caldwell said that comparing proportionate costs of wood and steel construction of outdoor substations, excluding transformers and arresters, showed the wood to cost about one-half that of steel construction, but the latter probably made up the difference in permanency and sightliness. It was his opinion that the expense of arresters is not warranted on small installations; at 15 of his company's substations only two transformers had been burned out, due to lightning, over a period of years, though a number of bushings had been burned off. He considered it good practice to have insulators on switches have 25% more capacity than line insulators.

G. H. Lukes, Public Service Co. of Northern Illinois, expressed the need of an inexpensive outdoor automatic oil switch as well as a lightning arrester.

In closing the discussion on Mr. Young's paper, Alfred Alsaker, of the same company, brought out some additional points. Wood structures should be provided for operators to stand on when opening air-break switches. Electrolytic arresters are satisfactory but too expensive for small substations. The trouble with the resistance type is that it is usually set wrong; twice line voltage is about right.

Testing of Meters.

Data tending to show installation tests could be eliminated on some types of meters and the time between periodic tests could be materially increased was presented in a paper by R. A. Keller, Central Illinois Light Co., Peoria, on "Installation and Periodic Meter Tests." Tests made by this company during the first eight months of this year on 2500 meters (of several different makes and sizes) showed 81.3% were within 2% correct and 95% within 4%. Cost of making these installation tests was 48 cts. per meter. It was recommended that installation tests on single-phase meters up to 25 amperes capacity could be eliminated. The requirements of a number of states as to periodic tests were tabulated and showed considerable variance. Test figures indicate the accuracy of the small capacity induction type meters and it was Mr. Keller's opinion that the period of tests could be made as long as five years on this type without appreciable inaccuracies.

Commenting on the paper, R. B. MacDonald, Peoples Power Co., Rock Island, said the factors of vibration, shock and temperature were more important than making installation test 30 or 60 days after laboratory test. It is difficult to conduct field testing because it is hard to get competent help. Periodic tests should be based on character of load in each instance. One period for all is not consistent.

After some discussion, the convention passed a resolution to place a petition before the Illinois Public Utilities Commission asking for an extension of the 30-day limit for test after meters are installed.

W. R. Leeper, representing the United States Chamber of Commerce, addressed the convention and requested the co-operation of the association in destroying radicalism against business, harmonizing relations between employers and employes, equalizing foreign trade conditions, and creating the viewpoint of every citizen as to the national aspect of each individual business.

Rural Electric Service.

A paper on "Extensions of Electric Service to Rural Customers" by D. W. Snyder, Bloomington & Normal Railway & Light Co., Bloomington, contained some pertinent information regarding the necessity of providing rural service, the adoption of standard plans of rendering service and the correction of present systems of rate making. Most farmers do not use sufficient energy to make the business remunerative unless they pay for maintenance cost and core losses. The widespread use of farm-lighting systems show farmers want electric service and are willing to pay for it, so that the demand for central-station service appears to be on the rise, and managers should prepare for it.

E. H. Negley said group farmer business should be compared to that of a small village, say of 400 inhabitants, where a great deal of expense is involved per kilowatt-hour sold, and that the remedy as to income was proper apportionment of charges.

B. H. Peck urged the appointment of a committee to study the question, prepare service standards and rates and submit same for the approval of the Public Utilities Commission.

Development of Favorable Public Opinion Toward Utilities.

Under this title John F. Gilchrist, Commonwealth Edison Co., presented a paper, read by B. J. Mullaney, which discusses methods of influencing the public's attitude in favor of utility companies. It is published on other pages of this issue. Mr. Mullaney, who is secretary of the Committee on Public Information, N. E. L. A., outlined the publicity work that had been accomplished throughout the state in connection with newspapers.

The election of officers resulted as follows: B. J. Denman, Moline, was re-elected president; Adam Gschwindt, Rockford, vice-president; R. V. Prather, Springfield, re-elected secretary-treasurer. The executive committee will consist of B. J. Denman; H. E. Chubbuck, Peoria; D. E. Parsons, East St. Louis; R. S. Wallace, Peoria; Frank J. Baker, Chicago; H. V. Channon, Quincy; W. A. Baehr, Chicago, and M. E. Sampsell, Mattoon.

KANSAS CITY JOVIANS ELECT OFFICERS.

The Jovian Electric League of Kansas City held its annual meeting Oct. 17, with the election of officers resulting as follows: President, J. E. Launder; first vice-president, W. B. Satterlee; second vice-president, F. F. Rossman; third vice-president, H. C. Blackwell; fourth vice-president, Sam Furst; secretary, P. L. Lewis. New members of the executive committee are J. D. Todd, W. M. Hand, R. W. Hodge, H. P. Wright, and holdover members are Sam Furst, A. P. Denton, P. J. Kealy and F. M. Bernardin.

WASHING-MACHINE MANUFACTURERS DENOUNCE PREMIUM PLAN.

American Washing Machine Manufacturers' Association Prepares Arguments Against Practice of Giving Premiums to Encourage Sales.

In considering the premium plan of selling electrical appliances, especially washing machines, at present employed to some extent in the industry, the American Washing Machine Manufacturers' Association, under recent date, adopted the following resolution: "The association condemns as unfair and not good business the practice of giving 13 machines for the so-called price of 12; or the practice of giving a premium or premiums of any kind or description with or for the sale of washing machines."

This resolution expresses the attitude of washing-machine manufacturers on the subject of the premium merchandising plan of selling washing machines. Every effort is being used to have the premium practice discontinued and the following summary of arguments has been drawn up by the association to urge the discontinuance of the so-called premium plan of merchandising of household electrical devices.

Electrical household appliances and electrical household labor-saving devices, properly merchandised, offer to public utility corporations a channel or a means of developing a decent relation between themselves and their customers. Electric ironing machines, washers, toasters and ranges offer a means of satisfaction, comfort and happiness to their users which may and should be used by the public utility corporations to develop the right sort of confidence in them.

At present there is a question in the minds of the executives of the public utility corporations and of their national associations as to the future of the public utility corporations as merchandisers of electrical devices. In the early days electrical devices were sold at any old price in order to obtain the revenue from the sale of current to operate them. No effort was made to really sell electrical devices on their own merit and on a legitimate merchandising basis or plane. The idea was to get the devices in use, no matter how, so that additional current would be used and paid for by the public. The results of such a so-called sales policy have been two-fold. Electrical dealers were hampered in their sales of electrical devices because they could not do business without a profit. This class of dealers—many of them real merchandisers—resented the sales policies of the public utility corporations. Manufacturers producing electrical devices sought channels of distribution other than the public utility corporations because their products were not sold on a legitimate basis.

Information now comes to hand that many of the public utility corporations have decided on a new policy as to sales of household electrical appliances. Some of them are employing real merchandisers to sell these devices on the right sort of basis. Such public utility corporations will probably develop into real distributors of washing machines, the sales records of which will equal those of some of the best specialty dealers in the country. Other public utility corporations are still, practically, giving away electrical devices or premiums with them. Their argument for this policy is about as follows: "The giving away of a premium with the device or the sale of the device below current market price reduces our profit per unit but it whips up our volume of sales so that the bulk profit—including revenue from increase of sales of current—is greater. We are in business to make money. We are making it and more of it. Therefore, our policy justifies itself from the money point of view."

Some years ago the premium plan of selling goods was quite the fashion. Every housewife and every tobacco user was saving stamps or coupons under the belief that they were going to get something for nothing. Then the savers of stamps and coupons began to wonder where the fortunes came from which the owners of stamp and coupon corporations were displaying; it dawned upon them that they were paying for the stamps they saved, and in addition some one was making a profit out of their stamp-saving proclivities. The reaction came and is here.

In the second place, many have lost sight of the fact of the extremely rapid development of the whole household electrical devices industry. How can any one prove that the increase in the volume of their sales of household electrical devices is due to the premium plan of merchandising? As a matter of fact, the increase in their volume of sales of household electrical appliances is probably due to the enormous increase in the demand all over the country for household labor-saving devices, electrically driven or otherwise. Washing-machine manufacturers need not be again informed on this point. They know how great the demand is for their product and they know that this demand has been created by conditions in this country which are far removed from any premium—lamps, stamps or anything else—plan of merchandising.

Executives of all public utility corporations should be fully informed that they should not use the sales records of corporations using the premium plan of merchandising electrical devices as a basis for judgment on the question as to whether or not they should use the premium plan. The sales records and increase in revenue from increased sales of current of a public utility corporation using the premium plan now do not prove or mean anything as to the merits of the premium plan. Such sales records only show whether or not the public utility corporation has followed the tide in increases of sales of household electric devices by all classes of dealers. All of the manufacturers are behind on orders.

The dealer who gives trading stamps, vacuum cleaners, or anything else with the sale of a washing machine is only creating trouble for himself which is sure to react and for the whole electrical industry. Now is the time, if there ever was a time, when the public should be thoroughly educated to the view that when a household electrical device is purchased no premium goes with it; but that the purchaser does get one hundred cents worth of device for every dollar it costs.

STUDENT BRANCH OF A. I. E. E. ORGANIZED IN MILWAUKEE.

At a meeting of faculty and students of the School of Engineering of Milwaukee, Wis., held on Oct. 21, a branch of the American Institute of Electrical Engineers was organized with a membership of about 200. At the meeting Dean John D. Ball presided and Arthur Simon, Harrison P. Reed and Prof. F. A. Kartak spoke. The following officers were elected: J. D. Ball, chairman; Henry Lowcock, vice-chairman; John L. Gordon, secretary; W. H. McCoy, treasurer; B. A. Bovee, director at large. Meetings will be held on the third Friday of each month.

Commercial Practice

Low First Payment Policy—Relations of Central-Stations to Contractors and Dealers—Electric Pumping for Sluicing

CENTRAL STATION ADOPTS PART-PAYMENT POLICY OF $1 DOWN.

As a special inducement for the purchase of electrical appliances the Commonwealth Edison Co., Chicago, has, during the current week, been selling such devices as washing machines, ironing machines, flatirons, vacuum cleaners, electric talking machines and the like on a basis of an initial payment of $1. Subsequent payments may vary from $1 to $5, depending on the total cost of the article in question.

The offer, which held for the one week only, is the result of observation as to customers' attitude toward the amount of the initial payment in connection with the part-payment plan. According to a statement by E. A. Edkins, manager of the Commonwealth Edison Co.'s electric shops, it has been found that a low initial payment policy has been productive of increased sales in comparison to one calling for high first payment, and this in spite of the fact that no change is made in the amount of the regular monthly payments. For instance, the number of prospective customers who will pay $5 down on an appliance is considerably less than those who will pay $2.50, and a surprisingly larger number will purchase at $1 or $1.50 than at $2.50.

The explanation seems to be a matter of valuations; as a general rule, the individual does not consider $1 as beyond his or her means, while $2.50 or $5 is an outlay of money. The future will take care of the monthly payments in either case. As far as the credit risk is concerned, the purchaser is as good a risk at a $1 as at a $5 initial payment.

THE RELATION BETWEEN CENTRAL STATIONS AND CONTRACTOR-DEALERS

Some Policies and Theories of Pacific Power & Light Co. That Have Proved Effective.

In a very illuminating manner, John V. Strange, Pacific Power & Light Co., Portland, Ore., discussed before the recent convention in Seattle of the Northwest Electric Light and Power Association the important matter of relations between the central station and the local contractor-dealer from the three aspects of prices, merchandising and campaigns.

Mr. Strange approaches his subject in the light of the experience of the Pacific Power & Light Co. which company is engaged in supplying electrical energy for the most part in the smaller communities. Fifty per cent of its total residential customers live in communities of less than 5000 population and 10% of the total live along rural lines radiating out from small population centers. It is absolutely essential in a few of the towns that the company handle appliances in order that its customers may have the opportunity to secure these devices. In other communities the need is catered to by contractors and in some of the larger centers the situation would be completely met were the utility to refrain entirely from selling appliances. Regardless of local conditions, however, the company is actively engaged in pushing the sale of electrical appliances in all its territory.

Mr. Strange expressed sympathy for the man who attempts to make his livelihood through the sale of electrical appliances and electric wiring contracting, especially in the smaller communities. As a rule he is a man with limited capital and in many ways he seems to be under a handicap. As a class he certainly has improved wonderfully in the past few years but still he needs encouragement and at least some moral assistance. The Pacific Power & Light Co. feels that he is absolutely necessary because it is not disposed to go into the electrical contracting work except where it cannot be avoided. This being true, endeavor is being made to conduct appliance selling efforts on a plane where the dealer-contractor can compete and be successful.

In years past the sale of current-consuming devices has been looked upon by the central stations as a necessary side line, the central-station manager realizing that he must carry a line of appliances so that a customer might have an opportunity to purchase if he so desired. In most places there was no dealer with the inclination to pioneer in the industry, consequently the central station became the exclusive appliance dealer. This fact has had a tendency to discourage the sale of appliances. The average customer said, "You handle appliances because you want to increase my lighting bill." After years of hard educational effort on the part of the central station, the public has been awakened to the economy, convenience and service afforded through the use of the electrical appliance and the patron of the central station has awakened to the fact that electrical appliances are offered for sale because of their real serviceable value and the current consumed in the operation of such appliances is merely a nominal and incidental operating expenditure.

This, Mr. Strange felt, is a great victory for the persistent educational campaign that has been waged during all these years by the central stations, dealers and appliance manufacturers. The electrical appliance dealers and manufacturers have played an important part in this campaign and it has occurred to him that the logic of the position of these men who have expended their money in the manufacture of a household article entirely dependent upon the use of electricity for its operation and who have had no financial connection with the central station industry, has done more to remove the prejudice that existed in the minds of current-consuming customers against the free use of appliances than any other influence. A few years ago the prospective purchaser wanted to know, "How much current will this article consume?" while today the question is, "Will this article give me the best service?" It is the great educational work of recent

years that has been done through the national advertising of our manufacturers and jobbers and the persistent efforts of the local dealer have brought about this change.

We all know now that we have arrived. The day of selling electrical appliances is here. The least of our troubles is to sell—everybody wants to do it electrically. The important thing today, it seems, is to try to elevate the standard of the appliance selling business so as to make it a really profitable adjunct of our central-station industry. If prices cannot be maintained and merchandising made a self-sustaining department, it should be abandoned entirely. A study of the industry shows that the list price established by the manufacturer is a fair price for the customer to pay and is not more than enough to enable the central station to pay the expenses incidental to this department with the overhead profit remaining to which it is entitled. In analyzing the business from this standpoint it will be found that the utility is confronted with the same elements of expense that the exclusive appliance dealer encounters. In bringing the margin of profit up to a point where these elements of expense are covered and are not swallowed up by the main industry, that of manufacturing and distributing electric energy, the appliance business is placed upon a plane where the dealer can successfully compete and he is thereby encouraged to extend his efforts in merchandising.

The automobile is sold today as a labor-saving and pleasure-affording vehicle of transportation. The electrical appliance is now firmly entrenched as a part of the essential equipment of the modern home and business because of equal importance. The automobile has from the start been pushed by dealers and at no time was it ever sold by gasoline manufacturers as a gas-consuming device. The electrical appliance was, in the early stages, handled almost exclusively by the central station but not until the public became convinced of its value and the idea that it was being sold solely because of its ability to consume electrical energy was dispelled, did it come into almost universal use.

Now that the electrical appliance has been introduced, the pioneering work is over and it is accepted universally that no home equipment is complete without an assortment of electrical labor-saving and comfort-affording devices. As central-station appliance dealers, the utilities should take stock of the opportunities. If they are to continue to sell appliances, and there seems to be no reason why they should not do so, they should elevate the standard of the business, thereby encouraging the dealer to compete. Full list price should be maintained; an additional price for time payment sales sufficient to pay the cost of carrying installments plus interest on the capital engaged is justified; stocks should be standardized so that it is possible to keep investment to the minimum and afford a creditable percentage of turnover and, as a further result, the element of obsolescence will be minimized. The utility will be in a position to take on the improved types of appliances promptly and should carefully select all appliances on which they standardize with the idea of service as the predominating factor.

All washing machines wash clothes cleanly. One may do the job a little quicker than the other and with less wear on the garments but the essential thing is, will the appliance be in operation Monday morning or will the central station have to send a service man to the house to make repairs or adjustments before the housewife can continue the operation? This is the big consideration. After selecting the appliance that gives the maximum of satisfaction and the minimum of operating trouble, standardize on it and handle it exclusively. Attempt to handle an appliance to meet every whim of the purchaser, which removes the strongest argument, which is, "We handle this appliance because we have found it to be the best."

Mr. Strange believes in campaigns. Enthusiasm is the life of any business and it takes some kind of a revival to keep up this spirit of enthusiasm. His company has found campaigns in which the several branch offices compete to see which can make the best record as productive of excellent results. Reduced price campaigns are of doubtful value although they are, at times, necessary in order to move merchandise that has accumulated through mistakes in buying and because of obsolescence.

RAISING GROUND LEVEL BY MEANS OF ELECTRIC PUMPING.

Five Hundred Horsepower Taken from Lines of Public Service Co. of Northern Illinois for Use in Construction Work.

At the new plant of the H. W. Johns-Manville Co. being built just north of Waukegan, Ill., a novel application of electric current is being made in conjunction with raising the ground level about 4 ft. by pumping sand and gravel from one portion of the property on to another portion.

A steam shovel has dug a 4-ft. ditch from Lake Michigan parallel and closely adjacent to the electric line. About 1000 ft. from the lake a pond about 40 ft. square and 14 ft. deep has been dug. In this pond a large scow has been built, on which are installed the following items of equipment: Three 200 kv-a. 2300-volt to 440-volt power transformers, 5 kv-a. lighting transformer, 400-hp., 440-volt, slip-ring motor, driving a large centrifugal pump; 75-hp. motor driving a smaller centrifugal pump; 50-hp. motor on a hoisting engine; 10-hp. motor driving a small reciprocating pump.

The pump on this scow will pick up sand and gravel from the bottom of the pond and pump it through an 18-in. pipe line about 2000 ft. long to a point where factory buildings are to be erected, the grade at this point being raised from four to seven feet. As the sand and gravel are pumped to a depth beyond which the contractor does not wish to go, the scow will move along so that when the job is done a channel 200 ft. wide by about 14 ft. deep will have been dug from Lake Michigan across the customer's property, a distance of nearly a mile. At some future date this channel will probably be used for harbor facilities for this customer. The centrifugal pump driven by the 75-hp. motor is used to loosen up sand and gravel on the bottom of the pond, pumping water out of the pond and forcing it against the bottom through a nozzle which will give a high velocity jet.

Public Service Co. current at 2300/4000 volts is carried on to the customer's property, and a line is then run a distance of about 4000 ft. to Lake Michigan.

Current is carried from the pole line along the channel to the barge by means of a No. 4 submarine cable supported on pontoons.

This plant will operate day and night until extremely cold weather sets in, as it is desired to complete the fill as early as possible.

Operating Practice

Locating Defective Pin-Type Insulators—Handling Underground Cables—Bare Wires—Oil Switch Safety Feature

TOOL FOR LOCATING DEFECTIVE PIN-TYPE INSULATORS ON WOODEN POLES.

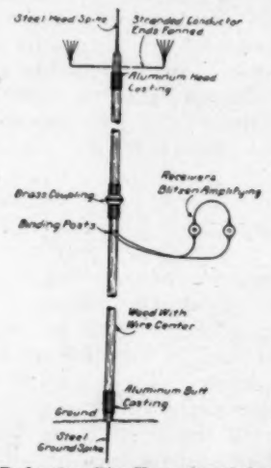
Abstract of Paper Before Southeastern Section, N.E.L.A. Valuable Experiences on Insulator Testing.

The tool shown in the accompanying illustration is designed by T. F. Johnson, Georgia Railway & Power Co., for locating defective pin-type insulators located on wooden structures. Its usefulness is almost entirely limited to those lines upon which the supporting structures are wood, such as wooden poles or built up wooden structures. The most satisfactory results are obtained on those lines on which crossarms and pins are both wood; however, it works well on those lines upon which the crossarms are steel with steel pins and not grounded, or upon which the crossarms are wood with steel pins, but no results can be obtained on lines such as steel tower lines or lines on which the cross arms and pins are steel and grounded. It will not under any condition locate a leaking or defective suspension type insulator, its usefulness being entirely limited to types of construction as explained above and pin-type insulators.

The instrument does not locate all defective pin-type insulators existing upon a line at any one time. It locates only those defective insulators which are so defective that they have started to leak. Pin-type insulators as it is well known, are defective for a considerable time before any appreciable leakage starts. However, by covering the line, as a general proposition, about four times a year with one of these instruments, all line outages due to insulator failures can be eliminated if the leaky insulators located by this instrument are removed as soon as possible after they have been located.

This instrument may be considered in a way as a small wireless antenna, and perhaps works partly on wireless principles and partly by induction. Anyhow, long experience has established that it does work, and will without fail, in the hands of an experienced patrolman, locate definitely a pole on which there is a leaky insulator. Note, in the above statement nothing is said about locating any particular leaky insulator on a pole on which there is a leaky insulator. The instrument shown in Fig. 1 is a wooden pole, joined in the middle so that it may be taken apart for transportation, with an aluminum head casting carrying a steel head spike and also a stranded conductor antenna; the ends of the conductor being turned vertically and fanned out. The head casting is connected with one binding post by means of a wire inside the stick; the lower half of the fault finder is of the same construction, the aluminum butt casting being connected to the other binding post. Across these two binding posts is connected a pair of amplifying telephone receivers. The telephone receivers are worn by the patrolman carrying the insulator fault finder.

To locate a pole on which there is a leaky insulator, the fault finder is put together as indicated in the sketch, with the receivers connected across the binding posts and the stranded conductor antenna arranged as shown. By sticking the steel ground spike in the ground as near the base of the pole as possible, and with the fault finder in a vertical position, with the antenna preferably parallel with the line conductor, the steady inductive hum of the line can be heard in the receivers; this hum is always heard when the fault finder is erected in the vicinity of a working line.



Tool for Locating Defective Pin-Type Insulators Supported Upon Nonmetallic Structures.

A leaking insulator makes itself known by a more or less intermittent scratching sound superimposed upon the inductive hum of the line. After a little experience, leaks are easily located, and a man soon learns about how long to listen at a pole for a leak before moving to the next pole. The worst leaks can be heard by simply sticking the fault finder vertically in the ground as described above, but in cases of very slight leaks it is often necessary to stick the steel head spike in the pole as far up as can conveniently be reached, holding the aluminum butt casting in one hand.

The fault finder when used in connection with the amplifying telephone receivers, is a very sensitive instrument, and it takes some experience to tell the difference between a leaking insulator and the corona which some times occur on small tie wires. Leaking insulators can be heard for a considerable distance by simply carrying the fault finder on the shoulder (rifle fashion), and holding the aluminum butt with one hand.

As pointed out, the fault finder locates the pole on which there is a leaking insulator, but does not locate the particular insulator which is leaking. To locate this particular insulator use is made of a set of amplifying receivers similar to the set used with the fault finder, by touching one end of the receiver cord to the through-bolt on the pole, and the other

end of the receiver cord a short distance out on the cross arm; preferably the ends of the receiver cord should have sharp pointed instruments attached to them so that they can be buried in the wood. The end of the crossarm on which there is no defective insulator, will give no indication as the receiver cord is moved out along the bottom side of the crossarm. However, by repeating this operation on the other end of the crossarm, the defect will show up as the end of the receiver cord is moved along the crossarm on the end of which carries the defective insulator, the sound in the receivers will get louder until the point bearing the defective insulator has been passed. The sound then remains constant, or diminishes a little.

In a great many instances upon climbing a pole as described above to locate insulators, the crossarm braces will be found hot, or the insulator so noisy, or various other indications so clear that the application of the receivers will be obviously unnecessary.

METHOD OF HANDLING IMPORTANT FACTOR IN BEHAVIOR OF UNDERGROUND CABLES.

Failure of High-Voltage Lines Frequently Traceable to Careless Installation.

Every company operating high-voltage underground conductors knows that considerable damage can be done to these cables at the time they are being installed. The most frequent causes of damage are bends of small radius, too frequent bending, impact that causes cracks in the lead sheath and voids between sheath and insulation.

Speaking of the effect of careless handling upon conductor behavior of high-voltage underground conductors before the eleventh annual convention of the New England Section, N. E. L. A., held Sept. 22 to 24, inclusive, Wallace S. Clark cited a number of instances where it had been proved that bends of small radius are injurious to the conductor and lower very materially the dielectric strength.

In one investigation on a single-conductor lead-covered cable having an insulation of 5/32-in. thickness of saturated paper, a test voltage was applied, starting at 15,000 volts and increasing it at the rate of 2000 volts per minute until breakdown occurred. The lowest breakdown potential in 32 tests was 32,000 volts and the highest 48,000 volts; or expressed in volts per mil, 200 and 310 volts per mil, respectively. Duplicate samples were bent at an angle of 180° around a 11-in. mandrel, then straightened, and reversed through three cycles. Test voltage then showed that the lowest breakdown pressure was 15,000 and the highest 30,000. All samples were 10 ft. in length. This test showed that before bending the highest breakdown potential was 50% above the lowest, while after bending it was 100% above the lowest, proving that bending does materially lower the dielectric strength of underground conductors.

USE OF BARE WIRE ON LOW-VOLTAGE CIRCUITS.

Pertinent Reasons Advanced for Adhering to Use of Insulated Wires for Outdoor Transmission.

In reply to a circular sent to central stations in Canada, A. A. Dion, of Ottawa, chairman of the Canadian Electrical Association's committee on overhead lines, received the following letter from one of the companies:

"Regarding bare wire for line use under 2200 volts, it has never been the practice of this company to use bare wire for city distribution and although it is generally understood that the insulation on the wire, especially after it has been baked out, is no adequate protection for 2200 volts, insulated wire is useful in the erection of the lines because the insulation protects the wire from mechanical injury and prevents linemen coming in contact with live lines already installed.

"Our company's rules provide that all lines are normally considered alive by our men and work done accordingly. Lines are only treated as dead when known to have been killed properly and the proper clearances given. In order to show differentiation between primary and secondary lines, lines of 2000 and 4000 volts are erected on porcelain insulators, while low-voltage lines are on glass insulators.

"Use of both bare and weatherproof wire would necessitate carrying two classes of wire in stock as well as on repair and construction wagons. In city work the primary is only a small part of the distribution system and it would be still necessary to supply insulated weatherproof wire for all service work.

"In outlying districts where primary runs are long and service connections few, it would likely be considerably more feasible to use the bare wire."

Mr. Dion states as his own opinion that while ordinary weatherproof triple-braided insulation is not altogether effective, and linemen should treat all wires as alive, still the insulation is some measure of protection in dry weather and he favors its use on city streets.

SPECIAL SAFETY FEATURES FOR INDICATING OPENED CIRCUIT-BREAKERS.

Safety Indicating Lights Feature of Philadelphia Electric Co.'s Operating Procedure.

When a circuit-breaker is opened for repairs or any similar reason, the Philadelphia Electric Co. not only employs a tag or card stating why the circuit-breaker is open, by whom opened and on whose authority, and mechanical blocks for preventing accidental closing, but a special illuminating system for showing when a circuit-breaker is open is also employed. At the load dispatcher's office miniature electric lamps fed from a source of supply through "jacks" indicate upon the system dispatch board when a circuit-breaker has been reported opened anywhere on the system.

In the stations, not only is a circuit-breaker cell locked when the switch had been opened for special purpose, but inside each cell is installed an incandescent lamp which can be clearly seen through the wire glass panel at the front. These lamps are controlled by the mechanism of the circuit-breaker and are so located that they cannot fail to be seen when anyone looks at the disconnect switches between the circuit-breaker and the bus. These indicating lamps, in addition to those located on the switchboards and benchboards, are colored green and are in circuit only when the circuit-breaker is open. They serve the additional purpose of indicating when it is safe to pull the disconnect switches controlling the circuit-breaker which is shown to be open by the fact that the lamp burns.

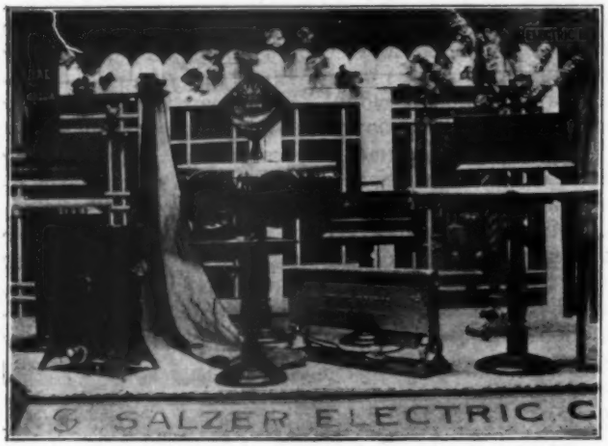
Contractor-Dealer

Week End Specials Part of Merchandising Plan—Collecting Bad Accounts—Contractors Organize Bureau of Education

PLAN OF SELLING WEEK-END SPECIALS USED BY CLEVELAND DEALER.

The Salzer Electric Co., Cleveland, Ohio, makes a practice of advertising a week-end special, an attractive price being made on a single electric appliance for Thursday, Friday and Saturday of each week.

Newspapers advertisements are linked with window displays to make its sales plans more effective.



This Window Display Was Used in Connection with Newspaper Advertisements Announcing Special Terms on Electric Radiators and Helped to Introduce Them to Many People Who Did Not Know the Convenience and Utility of This Electric Heating Device.

In connection with a recent sale of electric radiators the company inserted this announcement in the local papers:

ELECTRIC RADIATOR

Regular price, $12—Thursday, Friday and Saturday, only $9.

Just the heat for cool mornings and evenings, for bathroom or bedroom. At this price we can accept no telephone orders, C. O. D.s, charges or deliveries.

The window display space was carpeted with lavender cloth and a tall white vase in the rear was filled with branches of autumn leaves and wreathed with vines. In the center were the radiators mentioned in the newspaper advertisements, while the balance of the window space was given over to electric heaters and radiators of different types and prices.

SUCCESSFUL METHODS OF COLLECTING BAD ACCOUNTS.

Effective Collection Letters and a Series of Collection Media for Electrical Contractor-Dealers.

BY CHESTER A. GAUSS.

The most common way to collect overdue accounts is through the medium of collection letters which, if properly written, are not only cheap, but extremely effective. In writing these letters the appeal should be based upon plain human nature, for human nature is fundamentally the same the world over. Many people pay their bills just because they are honest. Others are too proud to have outstanding accounts, while still others will only pay bills through fear of action.

Most people are honest, so the first appeal to be made in a series of collection letters is one based on honesty. If a person is not honest, he generally has some pride, so the second appeal should be based on pride. There are still other people, but not a very large percentage, who deliberately try to avoid paying their bills. Such people can only be reached through fear of a lawsuit or other public method of collection. This gives us the third appeal that should be used, namely, one based on fear.

All three appeals should not be used in one letter, but only one in a letter. The first letter of a series of collection letters should be a strong appeal to the customer's honesty. Such a letter will bring returns from those who have lapsed in payment because of oversight or temporary inability to pay. This first letter should therefore be short and straightforward in the statement that the bill has evidently not been paid through oversight. The next few letters should be based upon the same appeal but more emphasis should be put on the fact that the debtor is expected to pay because he is truthworthy and honest. If three or four letters with the honesty appeal fail to bring a response. several letters based on the second appeal, that of pride, should be sent.

Failing to collect by appealing to both honesty and pride, there is only one other appeal that can be made in a letter, namely that based on fear. Whether or not this appeal should be used on any particular customer, depends upon whether or not it is worth while to let the account drag in the hope of future business. This fear appeal should not be used, as a rule, until relations have practically reached the breaking point. Before using the fear appeal it would be well to try some of the usual methods of collection mentioned later in this article.

The object in appealing first to honesty, then to pride, and finally to fear in collection letters is, of course, to eliminate outstanding accounts until only the hardest to collect remain. It must be remembered that many people who are honest but who have failed to pay, may have neglected to do so because they forgot or because they are low in funds and would welcome an extension of time. In the first letters, therefore, the dealer should give the debtor a chance to explain why the account has not been paid. Granting a short extension of credit to a man who has been ill or who has suffered a temporary business reverse will cement him to a store as a customer, but if he receives letters with a fear appeal there is great danger of eliminating him entirely as a customer.

Below are given sample letters with the honesty. pride and fear appeals. It must be remembered, how-

ever, that several letters with the same basic appeal should be sent a customer before changing the appeal. Each letter should attempt to eliminate those customers that have failed to pay for some particular reason. Always give the debtor a chance to explain his failure to pay, but don't create the impression that the debt can be dragged along, for it will decrease the effectiveness of all future letters.

Based on Debtor's Honesty.

Dear Mr. Jones:

I am hoping you enjoyed the coffee made in your new electric percolator. We know you feel that it is worth all it cost—$18—and more.

Upon referring to our books we find, however, that you have forgotten to pay your bill for it last month.

May we not be favored with payment before the end of this month?

Sincerely yours,

Based on Debtor's Pride.

Dear Mr. Jones:

Do you remember how everything that Midas of antiquity touched turned to gold? If we were Midas we would not be writing this letter and insisting upon the payment of your account of $18 with us.

Why have you treated us as you have? We certainly expected, at least, a reply to our previous four letters.

We know that you take pride in paying your bills promptly—in having a good credit standing in this town rather than to be rated as slow-pay by the local merchants.

We inclose a check on your bank made out for the correct amount—$18. Just sign your name to it and mail it in the inclosed stamped envelope. Like Midas, you will have converted your account into gold for us.

Sign it now before you forget. Thank you.

Sincerely yours,

Based on Debtor's Fear.

Dear Mr. Jones:

Your standing in this community is too valuable to you to permit it to be jeopardized over harmful publicity in a suit in court for a mere $18 which you owe us. It will mean attorney fees, loss of time at work and a lowering of the esteem by which you are held by your employers.

This is our seventh and last letter regarding this long overdue account of yours.

You owe it to yourself to permit no further delay and to avoid any unpleasant step you force us to take in this matter.

Isn't it worth sending us a check immediately to avoid action?

Sincerely yours,

It will be noticed that in the second letter reference is made to an inclosed unsigned check. This, of course, assumes that the name of the bank with which the customer does business is known. Collection letters with a personal touch like this pull best, for they serve to notify the debtor that the dealer is familiar enough with his business connections to cause trouble if his account is not promptly paid.

No collection letter can be effective if it lacks dignity and force and should not indicate a doubt about getting returns. The debtor owes the creditor money and the creditor expects it as a matter of course, not as a personal favor, because he has bills to meet, or for any other reason. In all cases the amount owed should be specifically mentioned and the request for payment should be made as definitely as possible.

Tracing the Skipping Debtor.

There is one kind of bad account which is too often given up as hopeless, but which still presents possibilities of collection—namely, that of a debtor who has removed to another section of the town or who has moved out of town, failing to leave his change in address. Letters sent through the mails will, of course, be forwarded to him but, secure in the knowledge that the postoffice is not at liberty to reveal his former address, he is likely to think that he is safe in believing that his creditors cannot learn his whereabouts.

The new address, however, can very often be secured from his employers, or if he has removed to another town, from his last employer with whom he is likely to have left a forwarding address either with the firm or with an individual in it. Then, too, the debtor's neighbors can often supply the information or refer to a friend who is likely to know the changed address. The superintendent or janitor of an apartment house also often knows of a friend or relative of the debtor's. In a small town the chief of police or a justice of the peace can often furnish the desired information themselves or secure it promptly. These individuals, however, have to be approached diplomatically so as to prevent a refusal or the creating of antagonism on the part of the debtor through his learning of any ill advised statements made to these individuals. In addition, in almost every town there is some kind of a retailers' credit association which traces debtors' movements within a town and, through the aid of other local bodies, learns a creditor's new address if he removes to another town.

Faulty Checks.

Checks are often received in payment of long due accounts which are intentionally or unintentionally left in such a way as to cause one at first sight to believe that he cannot collect them and that the check will have to be returned to the debtor with the request that it be made out properly and with the possibility of another long delay in obtaining the money. Faulty checks, drafts, etc., can, as a general rule, be collected through a bank if the dealer has evidence in writing of the remitter's intention to pay and will guarantee the bank against loss.

If the remitter sends a check on one bank and his letter states that it is on another bank, the creditor, if refused payment by the bank whose name appears on the check on the grounds that it has no such account, can guarantee its amount, make a note on the check that the remitter has no account at the bank named on the check, change the name of the bank on the check and deposit the check and letter of remittance with his banker again for collection. When a check is not signed it is easy to collect it by guaranteeing its amount and depositing it with a banker together with the letter that accompanied it. If the amount of the check is incorrectly given, or if it appears in the two places on the check as different amounts, the creditor can note on the back of the check the correct amount and guarantee it above his signature, attaching to the check the letter of remittance or a copy of his bill. If a check or a draft is made out to the debtor's order but is not endorsed by him and is remitted in payment of a bill, the creditor can supply the necessary indorsement himself as agent for his debtor, attaching the latter's letter as evidence of his authority to do so.

One of the most common tricks played by a debtor of little moral stamina is to write a letter saying that he is inclosing a check or draft, which he neglects to do, feeling that he is secure in claiming that the check must have reached the creditor and that he is not responsible for what happens after it gets into his place of business. Although such an explanation for refusing to send another check is of no value as a point of law, as the drawee could easily notify his bank to refuse payment on the first check and send a new one to his creditor, one often does not care to subject himself to further delay in collecting his bill or to sub-

ject himself to a lot of wrangling as to what became of the check. An easy way out of the matter is to draw a draft on the debtor for the amount named in his letter as being remitted and to deposit the draft with the letter of remittance attached, for collection through the bank, notifying the debtor that he failed to enclose a check and that you have made a draft out on him for the amount specified in his letter to save him from "further trouble" in regard to his account.

Unusual But Effective Means of Collecting Accounts.

Although a series of collection letters is one of the most commonly used, inexpensive and effective means of collecting bad accounts, especially for the electrical contractor-dealer, there are times when it is advisable to employ other means, many of which, although affective, are not so widely known.

One method which is as good in most cases as employing a personal collector at considerable expense is to put the matter in the hands of the American Railway Express Co. for collection. The express company will provide the merchant with an envelope in which he can insert the letter asking for the remittance or giving the choice to the customer of remitting in full or returning the goods in as good a condition as received. A charge of 25 cents is made by the express company whether or not it is successful in obtaining the money or the return of the goods.

The telephone is also another effective collection medium. Although it is not very effective in the case of those who will attempt to avoid payment at any cost, it enables the creditor to secure all the advantages of a personal call with a considerable saving in time and expense. That is, the creditor can discuss the matter as freely over the telephone as in a personal interview, employing appeals to honesty, pride and even using threats of action which he would perhaps hesitate to put in a letter while the account was in its present stage of collection for fear that the printed word is longer remembered than the spoken word. In fact, before sending a fear letter it would be well for the electrical contractor-dealer to try collecting over the telephone to avoid creating the ill effects that such a letter may create.

Another method which is effective, especially when an account is long overdue, is to send a strong letter which either directly or indirectly suggests the probability of stronger action being taken, by registered mail for which a receipt is requested. Such a letter serves to inform the debtor that his account is so long overdue that the credit is likely to take more serious steps and possibly wants the registry receipt for legal purposes. An example of such a letter, carrying a threat of action and designed to be sent by registered mail, is given below:

Dear Sir:

Not having received an answer to any of our eight letters regarding your account, we have registered this letter to make certain of delivery, so that if suit is filed against you, we have proof that you were properly notified:

Certainly you are aware of the fact that all retailers in this town are organized and that the debtor who does not pay his debts cannot obtain credit from any of them. Even doctors—the very ones you must call at critical times when every minute is precious—will blacklist anyone who is rated as poor pay. Surely you do not care to ruin your reputation for honesty and to reduce your standing in this community by refusing to pay a just debt.

If this matter is taken to court, it simply means a lot of unnecessary harmful publicity for you as well as a lot of unnecessary expense. You know when judgment is entered against a debtor, he must pay not only the debt, but all the legal costs and court costs for both sides.

We have always been willing to do the right thing by you and hesitate to cause you any trouble. If it is impossible to see us immediately, write us, inclosing a check for $25, the amount of your bill.

Act now, for in fifteen days we shall be forced to take this matter to court, thereby putting you to great expense.

Very truly yours,

A less drastic letter intended to be sent by registered mail and to create the impression that more forceful and unpleasant steps are likely to be taken if a remittance is not sent, could be worded about as follows:

Dear Sir:

This is the sixth time we have written you about your unpaid balance of $50 which has been standing against you for half a year.

To be frank, you have taxed our patience to the utmost and we do not intend to write you again in regard to this matter. We have, therefore, sent you this, our last letter, by registered mail so that we shall have proof of its receipt in case you cause us to take any unpleasant steps.

You are on the level. I know it.

You have as little use as I for the man who fails to live up to his written word. You trusted me and I proved worthy of your trust, sending your goods and not merely pocketing the small initial payment. I trusted you with much more, but you have repeatedly ignored your obligations to me. I hope you merely forgot to pay your bill. I know how easily it is to put off such things—also what a lot of trouble such a neglect may cause.

Don't force me to take other steps to collect this long standing amount. I should hate to do so as I value your patronage and good will.

Just send me a check today. It will be too late if you put it off a few days.

Thank you. Insistently yours.

BUREAU OF EDUCATION AND RESEARCH ORGANIZED.

National Association of Electrical Contractors and Dealers Completes Plans for Field Educational Work.

At the Milwaukee convention of the National Association of Electrical Contractors and Dealers representatives of that organization, the Associated Manufacturers of Electrical Supplies, the National Electric Light Association, the Electrical Supply Jobbers' Association and the electrical press made up a committee to consider the establishment of a bureau of education and research. The plan was given favor and each representative made the recommendation to his respective association to support it.

It is announced by the National Association of Electrical Contractors and Dealers that organization of the plans and work of this bureau is now well under way. A number of field men will be employed who are prepared to give dealers advice as to improvement of their stores and business methods, how to install and carry on proper cost, accounting and bookkeeping systems; in fact, give any assistance they can.

At present there are not many localities throughout the country where the co-operation between the manufacturers, central stations and retailers is all that it should be, but the bureau will in time bring these interests together to the end that it will greatly increase the retail distribution of electrical material. The field men, by means of personal work in the various localities, will also be instrumental in bringing together the three branches of the industry and by getting together the interested parties and directing their efforts towards the results desired will ultimately have all sections of the country working to accomplish the same end, namely, better electrical retail shops. The work of the field men will be supplemented by a series of lectures on such subjects as management, accounting and estimating.

New Appliances

Self-Regulated Range—Electric Rivet Heater—Utility Iron Set—Rough Service Battery Jar—Linemen's Safety Staging

New Hughes Automatic Electric Range.

Two distinctive features are combined in a new automatic electric range recently developed and placed on the market by Hughes Division of the Edison Electric Appliance Co., 5660 West Taylor street, Chicago. These features are an automatic time-controlling device and an automatic temperature regulator.

The time-controlling element is a simple device which can be set to automatically switch the current on and off at any hour or over any period of time desired. It requires no winding and is always ready for immediate use.

New Hughes Automatic Range.

The automatic temperature regulator consists of a device with a thermostat which automatically maintains the heat of the oven at any desired cooking temperature indefinitely. The proper oven temperature at which to cook the food is determined first; then the regulator is set by means of a lever as shown on the instruction card which is permanently secured to the side splasher.

As the oven is heated, an indicating pointer moves up the thermometer scale until it is opposite an adjustable pointer which designates the temperature at which the oven is to be heated. The current is then switched off by means of the thermostat; if the heat in the oven should reduce the indicating pointer will drop, and as soon as the indicating pointer drops below the adjustable pointer the current is again automatically switched on. This procedure is continued until the time set for the current to be switched off, so that an even temperature is maintained during the entire cooking operation. In other words, a curve plotted in terms of heat against time would show a sharply rising curve while the oven was being brought up to the cooking temperature, then a flat curve during the cooking period, and finally a slowly descending curve starting at the point where the current was switched off. The thermometer responds quickly to fluctuations in the heat of the oven and shows actual temperature in degrees whether the oven is being heated or cooled.

The manufacturer claims that the automatic regulator prevents extravagance in the use of energy by supplying just enough heat to keep the oven at the desired temperature. It saves food because it prevents scorching or burning, and at the same time provides the particular temperature best adapted for yielding the most nutrition and flavor for any kind of cooked food.

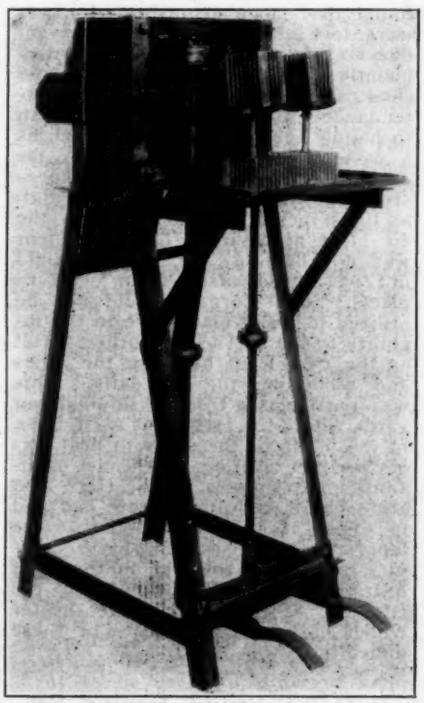
The range can be operated in three different ways: (1) The automatic time control and temperature regulator are both set, giving full automatic control. (2) The temperature regulator only is used, the current being switched on and off by hand at the oven switches. In other words, the temperature regulator is set, the switches operated by hand, and the indicating pointer moves up the scale and operates in the same manner as described above. This continues until the operator turns the current off by hand at the switches. (3) The temperature regulator is used as a safety device only, both the current and temperature being controlled by hand. That is, the temperature regulator is set at the top of the scale, so that there is no possibility of overheating.

The automatic feature for the time being will be confined to the Hughes type No. 50—right-hand oven only—and will be furnished in plain or nickel finish.

Electric Rivet Heater Possesses Many Advantages Over Old Methods.

In an effort to overcome the many difficulties involved in heating rivets previous to their being driven and riveted, the General Electric Co., Schenectady, N. Y., has designed an electric rivet heater which embodies low first cost with simplicity of operation, foolproofness of construction and maximum efficiency. This is accomplished by the following design.

A transformer rated at 15-kw. is mounted on angle-iron legs, which may be fitted with wheels. At the front of the transformer, two copper bars are fitted with heavy air-cooled electrode blocks of cast copper, and under these is another copper block which acts as a support and electrical connection for two rivets in series. When the rivets are stood up on the block and the electrodes are allowed to drop on the head of the rivet, the



Electric Rivet Heater, Which Does Its Work Reliably, Economically and Without Objectionable Features.

circuit is completed and heating begins. The two electrodes may be raised independently by two pedals, gravity being sufficient to lower the electrodes when the foot is removed. A primary tap switch mounted on the back legs of the machine gives all the variation needed for different lengths and diameters of rivets and rates of heating desired.

The advantages of this electric rivet heater are said to be the following:

(1) The higher efficiency of localizing the heat energy in the rivet resulting in less heat radiation.

(2) Better heat regulation in proportion to quantity of rivets used and

energy is used only when heating rivets, giving high economy.

(3) Production of heated rivets is 5 lbs. per kw-hr.

(4) Cleanliness—no smoke or gases are formed.

(5) No time is wasted in starting production.

(6) Quality of heat is better and minimum of scale forms. Rivet heats from inside out, giving more uniformity of heat and better upsetting conditions in shank.

(7) Wastage of rivets is reduced to a minimum.

(8) Heater is portable, takes any rivet up to ⅞ by 5 ins. without adjustment, and but two power lines are required to each heater, eliminating piping for oil, air or gas.

The sizes of heaters so far developed are a 5-kw., two-jaw type for rivets up to ½ in., and a 15-kw., two-jaw type for rivets up to ⅞-in. diameter. The two-jaw heaters are intended for one-gang use; however, in actual test the 15-kw. machine heated 500 ½-in. by 1¼-in. rivets in one hour, which is ordinarily enough for two gangs of gun riveters.

During a careful survey of present methods of heating rivets, it was found that large quantities of rivets were lost after having been driven, due to uneven heating and consequently failure to upset in the hole thus causing a leaky rivet hole. Attendance was large, requiring a man to handle the forge blower as well as a passer; auxiliary equipment of the oil-burning rivet heater was expensive, requiring in many cases as high as 10 hp. per oil burner to supply the air blast necessary. The equipment was not flexible; the burners could not be moved easily from place to place. Small forges could not be utilized in many places due to the inability to get fuel to the forge as well as the trouble of handling the ashes and rebuilding the fire daily. This was particularly true in shipbuilding yards where the forge was used down in the holds of the ships to heat rivets used in riveting bulkheads, partitions, floor plates, etc. Here the atmospheric conditions were bad and in some cases it was found that the laborers have instituted severe complaints against the old methods of heating rivets. All of this led to the adoption of the electric rivet heater which has overcome many of these difficulties.

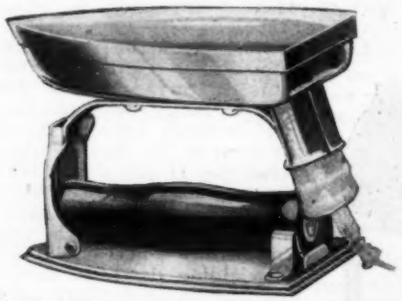
Hotpoint Utility Ironing Set.

A new electric appliance which is particularly appropriate for gift-giving purposes has been placed on the market by the Hotpoint Division of the Edison Electric Appliance Co., Chicago. It consists of a 3-lb. flat-iron, folding curling iron, and collapsible stand for inverting the iron when heating the curling iron or when used as a small cooking stove. The iron differs from the standard Hotpoint iron only in the following respects: It has no attached stand; has two holes in the rear for inserting of curling irons—thus two irons may be heated at the same time. When the stand supplied for inverting the iron is not used for that purpose it serves as an ordinary iron stand. The set fits into a very cleverly constructed folding box consisting of four wooden sides, hinged with cloth, so constructed that it will fold up in such a way as to provide closed ends. When folded in the box form it presents a very compact, neat appearance. The end of the decoratively printed cloth

Hotpoint Utility Set Consisting of Flat-Iron, Curling Iron, Ironing Board and Collapsible Stand for Using Set as Cooking Stove.

cover may be tied with a silk cord. The size when folded is approximately 8 by 4 ins.

The big feature about this folding box is that when unfolded flat it provides a very handy ironing board, with a surface of 16 by 8 ins., on which any little pressing job may be accomplished by the user. Thus the inconvenience usually experienced by travelers not having suitable ironing surface will be done away with.



Collapsible Stand for Using Hotpoint Utility Set as Small Cooking Stove.

New Battery Jar for Rough Service.

In certain classes of service the storage battery is subjected to extremely rough usage in different ways. For example, mining locomotives, industrial tractors and even automobiles, are subject to jolts and vibration, while the shocks that accompany collisions and derailments of locomotives and similar incidents place heavy stress upon the storage battery jars.

To meet this condition of rough usage, the Electric Storage Battery Co., Philadelphia, Pa., has developed a battery jar, known as the "Giant" jar. This battery jar is made of exceptionally tough material, having great strength under compression and tenacity to withstand impact. The result is that the jar is practically unbreakable; and, upon the basis of all reasonable working conditions may be claimed to be unbreakable. Exhaustive tests made by the manufacturer have proved that the "Giant" jar will stand a pressure of 2000 lbs. at its weakest cross section, while the old-style jar failed at less than 1000 lbs. The "Giant" jar has high dielectric strength, withstanding a potential test of 30,000 volts and has low unit weight. The Electric Storage Battery Co. states that the ability of this jar to withstand the severest service is causing it to be extensively used in mine-haulage service, for industrial tractors and similar work where a strong jar is needed to protect the storage battery.

Safety Staging and Guards for Linemen.

Even when using linemen's belts, working upon poles is not free from danger because of the possibility of the belt breaking or the likelihood of the lineman's spurs slipping out of the pole. In any case the fact that one's position is more or less restricted by the range of the belt and the fact that the feet are more or less rigidly fastened to the pole movement is limited and the speed at which work can be accomplished is affected. Then there are the safety aspects also.

The accompanying illustration shows a lineman's platform and guard developed by the Bush Electric Co., Cleveland, O., the purpose of which is to enable linemen to work with greater freedom and greater safety. The chief use of the Bush staging is on high-tension lines.

The staging is designed for the purpose of changing insulators, pulling up slack, grounding pins, testing insulators, etc., on high-voltage energized lines. It forms a solid platform on which the men can work and which is adjustable to any position, in or out, or around the pole. The wood from which these stagings are made is selected with utmost care and submitted to a special impregnating and drying process known as the Bush treatment. This treatment enables the wood to withstand a voltage of 5000 volts per inch so that if a workman should accidentally touch a 75,000-volt line while standing on the staging, he would not be injured. The safety guards are also made of wood similarly treated. When placed as shown in the illustration they serve as a reminder to the man to keep within certain bounds when working on the crossarm. Many otherwise impossible jobs can be done when these guards are used.

Bush Linemen's Stage and Guard in Use on High-Voltage Line.

Trade Activities

St. Paul Electric Appointed Westinghouse Agency—Matthews Light Plant Purchased by King of Siam

Citizens Electric Co., Hot Springs, Ark., will hold an electrical show in that city on Nov. 13, 14, and 15. Various manufacturers and jobbers have been invited to participate in the display of electrical devices.

James McEwan & Co., 488 Broad street, Newark, N. J., has been organized to engage in the production of electric and gas appliances and kindred specialties. Malcolm Thomas, Hackensack, and James McEwan, Montclair, head the company.

British Westinghouse Electric & Manufacturing Co. has changed its corporate name to Metropolitan Vickers Electrical Co. Through the recent amalgamation of Vickers, Ltd., with the Metropolitan Carriage, Wagon & Finance Co., the former became the controlling factor in the affairs of the British Westinghouse company.

L. V. Estes, Inc., industrial engineer, 202 South State street, Chicago, has prepared a booklet entitled "Human Relations in Industry," which in view of present conditions and the labor problem is particularly timely and of special interest. It presents a clarification of the principles and factors of industry and sets forth the underlying principles of personal relations and industrial management that are essential to industrial harmony and maximum production. It outlines in a general way the requirements of the work and the procedure necessary for putting into effect plans tending toward a betterment of human relations in industry.

Electric Furnace Sales.—Considerable activity in the sales of electric furnaces has recently been experienced by the Electric Furnace Co., Alliance, Ohio, the company having received the following orders for its product: Drew Electric & Manufacturing Co., Cleveland, Ohio, a 105-kw. furnace for melting yellow brass; Nolte Brass Co., Springfield, Ohio, a 105-kw. furnace of 1500-lb. capacity for melting yellow brass; Kennedy Valve Co., Elmira, N. Y., a 105-kw. electric furnace for red brass; American Bronze Corp., two 1500-lb. electric furnaces for melting bronze; Dominion Steel Products Co., Brantford, Ontario, Can., 50-kw. furnace of 500-lb. capacity for yellow brass; Deming Co., Salem, Ohio, a furnace of 500-lb. capacity for melting yellow and red brass; Miller Pasteurizing Machine Co., Canton, Ohio, a Baily 50-kw. furnace for yellow brass; Landers, Frary & Clark, New Britain, Conn., a 50-kw. furnace with capacity for melting 200 lb. aluminum per hour, and the installation of nine Baily electric furnaces for melting a wide range of non-ferrous metal and alloys.

The Electric Furnace Construction Co., Finance building, Philadelphia, advises orders received for "Greaves-Etchells" electric furnaces from Lacheze et Fils, Dijon, and C. Markham & Co., Ltd., Chesterfield.

The Triumph Electric Co., Cincinnati, Ohio, has appointed W. H. Thompson as works manager. Mr. Thompson was recently works manager of the Fairmont Mining Machinery Co., Fairmont, W. Va., and previously had spent 12 years with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Pelouze Manufacturing Co., 232-242 East Ohio street, Chicago, is sending out a new 25-page catalog on scales and electrical appliances. The first half of this publication is devoted to illustrated descriptions of Pelouze scales of various types and sizes. The remainder of the booklet deals with electrical devices manufactured by the company, among which are included electric irons, toasters, electric radiators, heating pads, etc.

The Roller-Smith Co., with main office and export department at 233 Broadway, New York City, manufacturer of electrical protective and measuring apparatus, announces that it is now represented in Cuba by Martinez Cartaya & Bueno, located at Muralla 40, Havana, Cuba. Martinez Cartaya & Bueno will handle the Roller-Smith products of electrical measuring instruments, watt-hour meters and circuit-breakers on an exclusive agency basis for the entire island of Cuba.

The Goulds Manufacturing Co., Seneca Falls, N. Y., is sending out a new bulletin entitled "Centrifugal Pump Sales Service Data." The data contained in this bulletin were first issued as a series of sales letters for the use of its selling organization, but because of the enormous demand for authentic information on the centrifugal pump, they have been reprinted by the company, placing at the disposal of its customers a vast amount of information on the theory, design, testing, practical application, etc., of these pumping units. The concluding chapters of this publication are devoted to detailed descriptions of the Gould line of pumps. The text is accompanied by numerous illustrations of typical installations and pumping units, and charts, showing head curves, efficiency curves and horsepower curves. The Goulds company is now in its seventy-first year as a successful producer of centrifugal pumps, which rank among the very best in this country in completeness, as well as in construction and design.

Western Electric Co., 195 Broadway, New York City, is making distribution of a new booklet entitled "The Eight-Hour Day in the Home," which treats in a unique way the housekeeping problem under the present servant shortage. The treatment of the subject matter marks a new epoch in electrical appliance advertising and the book carries the endorsement of a celebrated household efficiency expert, who is in hearty accord with the suggested solution of this problem, namely, the use of electrical labor-saving devices for the home. This booklet has been issued in connection with an advertisement that appeared in the Oct. 18 issue of the Saturday Evening Post. The advertisement also treats of the servant problem and how it may be mitigated, if not entirely solved, by the use of electrical appliances in the household.

The Pittsburgh Reflector & Illuminating Co., Pittsburgh, Pa., has prepared a very convenient calculator for quickly showing which of its show window reflectors should be used for the proper illumination of show windows of various dimensions. This calculator consists of a cardboard pocket holder with two slots near the top. At the left are shown different heights and depths of windows and at the right various heights of the background in feet. The window heights range from 7 to 14 ft. and the depths from 3 to 10 ft., while the window trim of background ranges up to 10 ft. A card placed in the holder has stamped on it in suitable rows the figures for height and depth of window and, at the right, the catalog numbers for the five different types of show window reflectors made by the company. By pulling out the card to any desired window dimensions, it is possible to instantly determine the type of reflector to be used for different heights of trim. On the outside of the holder are shown illustrations of the reflectors made by the company together with data relative each.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued motor application circular No. 7179 entitled "The New Farm Help." This is an attractively illustrated booklet with a three-color art cover and pleasing two-color pages, setting forth more than seventy uses to which electric motor power can be applied as an efficiency builder and labor saver on the farm. It explains not only how electric power can be utilized for doing a large amount of work on the farm, but how it provides the best, safest and most convenient form of light and how it takes the drudgery out of many of the hardest household tasks of the

farmer's wife. By citing various instances where electrical installations are in actual operation on farms, it proves that electricity is beginning to revolutionize agricultural life not only by making it more profitable, but by providing it with many of the comforts and conveniences heretofore found only in the city. It explains how central-station power may be secured where no service lines exist at present and gives instructions as to how to connect and distribute power about the farm. The booklet will be sent free on request to central station officials who are interested. The following information should be included with the request: Length of proposed line, number of possible consumers, number of original consumers and general plan of organization.

St. Paul Electric Co., jobber of electric supplies and appliances, 145-147 East Fifth street, St. Paul, Minn., has been appointed agent-distributor for the northwest territory by the Westinghouse Electric & Manufacturing Co. A complete and varied stock of Westinghouse products will be carried for which purpose an entire floor has been set aside. The company aspires to carry the largest stock of motors, meters, transformers and other power apparatus in the Northwest and to render to the trade service on apparatus such as no other distributor in this territory has heretofore been able to give. Facilities are provided for handling engineering work in connection with the proper installation of Westinghouse apparatus, and this department will be in charge of M. R. White. The Westinghouse agency will, in addition to the other manufacturers that it represents in this territory, enable the St. Paul company to handle a very extensive and varied stock of electrical apparatus either for the generation or use of electricity and supply everything from a socket bushing to a steam-driven turbogenerator.

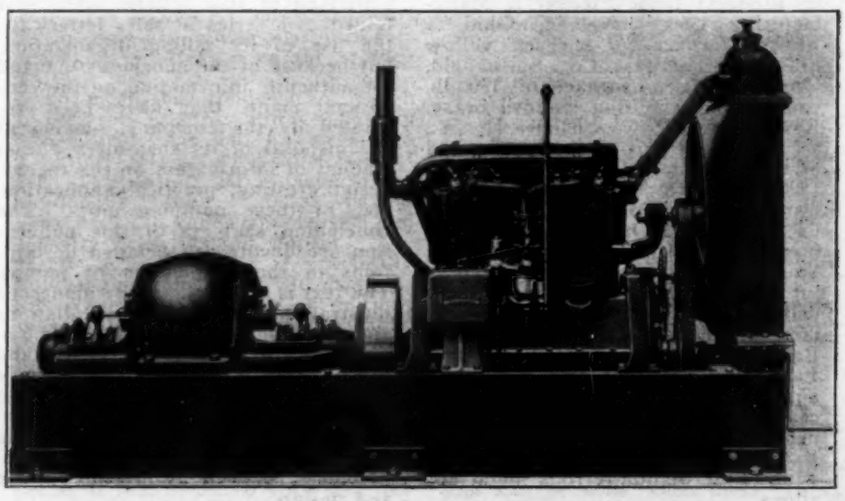
The Cutler-Hammer Manufacturing Co., Milwaukee and New York, has prepared a number of standard descriptive booklets which illustrate and describe various types of C-H apparatus. A recent addition to this list of publications is known as Booklet J and is illustrative and descriptive of C-H rectangular magnets, which are particularly adapted for efficient handling of regular shapes in steel and iron. The advantages of using a rectangular magnet over any other type of magnet for handling such material as sheets, bars, billets, ingots, pipes, etc., is maximum lifting capacity for a given weight of magnet, resulting in economy in the price of the magnet, crane equipment, and current consumption, and besides, greater speed in handling the material. The booklet makes mention of a few typical applications where C-H rectangular magnets are handling ship plates, pipe, cold-rolled steel in coil and other material. In one instance, one of the magnets had a record of unloading 50 tons of plates in 50 min. from a railroad car to stock pile. Numerous illustrations show the magnets in use in several prominent plants. Occasionally magnets are used in pairs. The booklet describes the magnet construction, gives dimensions and other engineering data and tables of lifting capacities for various classes of material.

The Esterline Co., Indianapolis, Ind., has issued a well illustrated book entitled "Typical Graphic Records." This shows 36 graphic records taken on Esterline recording instruments, these giving a very effective idea of the change in power consumption of various machines, changes in speed, variations in power-factor, fluctuation of gas production, transformer load record, etc. Through analysis of some of these power records extremely valuable results have been obtained in eliminating errors and losses in operation and production. In other cases, valuable data have been obtained for aiding in scientific rate making by power companies. The value of these records and the many possibilities of securing improvement in operation through a study thereof are pointed out in the publication. It also includes a number of views of essential elements of the Esterline graphic instruments and gives a brief description thereof. This publication should prove of great value to those somewhat familiar with the use of recording instruments but who have not fully realized the many possibilities of usefulness that they possess.

Zobell Electric Motor Corp., Garwood, N. J., has entered the field to manufacture alternating and direct current motors, ranging in size from 1 to 7½ hp. It is also intended to make a very high-grade motor with many new refinements. The design of the first line of motors has been completed in which the shafts may be removed without disturbing either the core or the commutator, and the commutator may likewise be removed without disturbing the shaft or core, a method which it is claimed has not heretofore been used on small motors. All refinements used on large motors are to be adapted to these small machines. A line of standard commercial motors is being brought out, but at present the company is principally devoting itself to building motors designed especially for machines on which they are to be employed. The equipment is designed to produce from 200 to 300 motors monthly. The company, which was recently incorporated with a capitalization of $250,000, has for its officers the following: Fred G. Bell, president; A. T. Zoebisch, treasurer, and F. E. B. Bucker, secretary.

Consolidated Utilities Corp., Chicago, factory distributor for Matthews full automatic electric light and power plants, recently sold to the King of Siam a 5-kw. electric plant to furnish light and power for the luxurious royal palace. The special representative sent by His Majesty spent considerable time investigating many factories and in studying the features of the various plants on the market, and because of its full automatic features, and its long proven reliability, as well as its wide use by the United States government, the Matthews full automatic plant was selected. On this same American trip a gold-plated typewriter was purchased. A 10-kw. Matthews electric light and power plant left the factory last week and was shipped to Rene Berndes, who is the ex-Hungarian consul for Cuba. Senor Berndes has recently gone into the sugar business and has an immense, modern plantation which requires an ample installation for both light and power, and the absolute dependability of this plant is of first importance.

The presidential train of the Republic of Mexico, renowned as perhaps the most elaborate train in the world, presented by the Pullman Co. to the Mexican government, has just been equipped throughout with electric lights and a Matthews full automatic plant was installed. This train was presented during the regime of Diaz and has been in constant service ever since. It is most lavishly decorated and finished without regard to expense, several of the interiors being trimmed in gold-leaf, with intricate and classic hand carvings, and inlaid with ivory. With its present Matthews equipment this train now possesses every possible modern convenience. These plants are the same as are used throughout America on thousands of farms, but are of larger models. The patented full automatic features of the Matthews make it a most popular plant where reliable service is expected. It gives the battery full protection at all times against over-charging or excessive discharge. It starts and stops itself automatically. These plants are built in seven sizes from ⅛ kw. to 25 kw.



Matthews Power Plant Used in Royal Palace of King of Siam.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Lewiston, Me.—Arrangements are being made by the Androscoggin Electric Co. for the construction of an extensive addition to its power at Deer Rips, on the Androscoggin river, near Lewiston, Me., for increased capacity. The project including machinery and equipment will cost about $200,000.

Ludlow, Vt.—Council has recently completed work on the extension of its power lines from the municipal electric plant to Smithville.

Springfield, Vt.—Colonial Power & Light Co. has completed arrangements with the Fellows Gear Shaper Co. for furnishing additional electric power for the operation of a new addition to its plant now nearing completion. The company has recently commenced the construction of a 3-phase line extension to the plant of B. Steinfield & Sons, for additional service.

Rutland, Vt.—Vermont Hydro-Electric Co. will build hydraulic plant and a dam to cost $450,000.

Boston, Mass.—Boston Insulated Wire & Cable Co. contemplates the erection of an addition to its plant.

Lowell, Mass.—Massachusetts Cotton Mills has awarded contract for the erection of a power house to cost $100,000.

Pittsfield, Mass.—Plans have been prepared for an addition to the plant of the General Electric Co., to cost $200,000.

Albany, N. Y.—Plans are under consideration by the board of managers of the Homeopathic Hospital, 161 North Pearl street, for the erection of a new heating plant, laundry building and solarium at the institution, estimated to cost $134,415. Considerable electrical and mechanical equipment will be required in connection with the proposed work.

Brooklyn, N. Y.—In connection with the construction of the proposed plant of the Gehnrich Indirect Heat Oven Co., 60 Franklin avenue, to be located at Buckley and Skillman streets, Long Island City, estimated to cost $100,000, considerable electrical and mechanical equipment for operation will be required. The new works will be a two-story structure, about 125x200 ft.

Brooklyn, N. Y.—Fahnestock Electric Co., Meadow street, manufacturer of electrical equipment, has completed negotiations for the purchase of property, about 50x100 ft., on East avenue, Long Island City, to be used as a site for the construction of a new machine shop.

New York, N. Y.—Announcement has been made by the Marconi Wireless Telegraph Co. of America, Woolworth building, that a contract has been entered into with the United States Shipping Board, Emergency Fleet Corp., for the maintenance of its wireless service on the 400 ships of the board. The agreement provides that the company furnish the necessary operators, and includes the maintenance and repair of the wireless apparatus.

New York, N. Y.—Considerable electrical and mechanical equipment will be required by the United Cork Co., 50 Church street, in connection with the construction of a new plant at Lyndhurst, N. J. The works will comprise a group of one-story structures, including main manufacturing building, and are estimated to cost $100,000.

Bloomingdale, N. J.—Plans are under consideration by the Borough council for increasing the electric lighting facilities in the Bloomingdale Flats district.

Dover, N. J.—Board of Water Commissioners is considering plans for the installation of new electrically driven pumping units at the municipal pumping station to replace the present gas engine equipment. Service is furnished by the New Jersey Gas & Electric Co.

Hoboken, N. J.—Fire recently damaged a large quantity of stock at the plant of the Cooper Hewitt Electric Co., 722-32 Grand street.

Hoboken, N. J.—Button Machinery Co., 1023 Clinton street, has awarded a contract to the Industrial Engineering Co., 30 Church street, New York, for the erection of a new boiler plant in connection with its proposed works to be located on 11th street, extending from Grand to Adams streets. The project is estimated to cost $170,000.

Newark, N. J.—Essex and Hudson county commissioners jointly have ordered the county engineers to prepare specifications for a new contract covering the lighting of bridges over the Hackensack and Passaic rivers in the respective counties for a period of five years. The present contract expires on Nov. 15.

Verona, N. J.—In connection with the construction of the proposed group of hospital buildings at the Mountain Sanatorium by the Essex county officials, work has been practically completed on the erection of the boiler plant at the site. It is understood that light and power service, as well as water, will be furnished from the Overbrook Hospital, Overbrook, and work has been completed on a new booster installation to be used for this purpose. A large laundry building is also included in the plans, and in this connection, considerable electrical and mechanical equipment will be required.

Washington, N. J.—In connection with the establishment of the proposed plant of the Merritt-Grieler Silk Throwing Co., on East Washington avenue, plans have been prepared for the installation of a new engine plant for general factory operation.

Allentown, Pa.—Peters & Jacoby Co., 627-29 Hamilton street, has recently completed extensive improvements at its plant, including a change in motive power to individual motor drive. It is said that the company is considering the erection of a new plant for the manufacture of ice cream, and in this connection considerable electrical equipment and refrigerating apparatus will be required.

Glen Mills, Pa.—Glen Mills Electric Co. has filed application with the Public Service Commission for permission to furnish electric energy for light, heat and power purposes to Thornbury township.

North Catasauqua, Pa.—Borough council has approved plans for the installation of the proposed electric street lighting system. It is understood that power for operation will be furnished by the Lehigh Valley Light & Power Co. for a period of about ten years.

Philadelphia, Pa.—Sears, Roebuck & Co. have awarded contracts for a large reinforced concrete building, 780x440 ft., and will represent an investment of approximately $7,500,000. George C. Nimmons & Co., Chicago, are the architects.

Philadelphia, Pa.—Announcement has been made by the Keystone Telephone Co. that plans are being arranged for the installation of automatic telephones, to replace the system now in use by the company throughout the Philadelphia district. Edward M. Cooke is vice-president and general manager.

Philadelphia, Pa.—In connection with the construction of the proposed building of the American Ice Co., to be located in Frankford district, contract for which was recently awarded to Cramp & Co., Philadelphia, considerable electrical equipment and refrigerating apparatus will be required. The structure will be of reinforced concrete construction, and will cost approximately $150,000.

Pittsburgh, Pa.—The department of public service will advertise for bids for furnishing and installing motor generator set in connection with the plant at the Department of Public Safety building. Address E. V. Babcock, mayor.

Pittsburgh, Pa. — Follansbee

Brothers Co., manufacturer of tin plate automobile and electrical black sheets, etc., has completed arrangements for a bond issue of $1,500,000, the proceeds to be used to cover the cost of the construction of a new manufacturing plant of like size as its present works at Follansbee, W. Va. The plant comprises four 35-ton open-hearth furnaces, six tin and seven sheet mills, and has an annual capacity of about 65,000 tons of finished material. William U. Follansbee is president.

Yardley, Pa.—Yardley Water Co. has recently completed the installation of a large new pumping unit at the local waterworks plant. Other improvements to facilitate service have also been made in the system.

Baltimore, Md.—Service Terminal Co. is understood to be considering plans for the erection of a large new local cold storage plant. Considerable electrical equipment, refrigerating apparatus, etc., will be required in connection with the proposed work.

Baltimore, Md.—Samuel T. Williams, 223 North Calvert street, is in the market for a motor-driven single-drum hoister, suitable for tub rig hoist, 50-hp. motor, a. c., 220 volts, 3-phase, 25-cycle; drum 30-in. diammeter, 24 ins. long with or without motor.

Welch, W. Va.—Welch Armature Co. will erect a three-story and basement building, 63x63 ft. John Doss, architect.

Wadesboro, N. C.—Extensive improvement will be made to the light system. Address mayor.

Denmark, S. C.—Edisto Public Service Co. is arranging plans for the erection of a new local plant, including the construction of a 10-mile transmission system to Stalo. The work is estimated to cost $40,000. R. A. Easterling is manager.

Gaffney, S. C.—City council is considering plans for extensive improvements and extensions in the municipal light and water system.

Orangeburg, S. C.—City is planning for a bond issue of $45,000, the proceeds to be used to cover the cost of proposed extensions in the municipal electric light system. W. A. Livingston is mayor.

Bainbridge, Ga.—Bainbridge Power Co. has organized with a capital of $100,000 to build dam and power house, to cost $75,000. The power house will be erected at Spring Creek. Bids will be asked for the machinery. J. M. Simmons, president.

Cochran, Ga.—City has approved the issuance of bonds for $15,000 to cover the cost of improvements in the municipal electric light and water systems. H. D. Sturdivant is engineer.

Spring Creek, Ga.—Bainbridge Power Co., recently organized with a capital of $100,000, is arranging plans for the construction of a local hydro-electric power plant with dam, estimated to cost $80,000. Included in the proposed work is the construction of a transmission system, which with machinery will cost about $55,000. J. M. Simmons is president; D. T. Sutherland, vice-president; and E. J. Perry, secretary-treasurer; all of Bainbridge, Ga. B. M. Hall & Sons, Peters building, Atlanta, are architects and engineers for the company.

Eau Gallie, Fla.—Eau Gallie Electric Co. will erect an ice and electric plant to cost $40,000.

Vero, Fla.—Vero Utilities Co. is arranging plans for extensions and improvements in its local power plant, to provide increased service, including the installation of new generating and engine equipment. It is also proposed to extend its lines to Vero Beach.

DATES AHEAD.

Jovian Order. Annual convention, Chicago, Nov. 5 and 6. Headquarters, Hotel Sherman. Acting Mercury, Eli C. Bennett, St. Louis, Mo.

Electrical Supply Jobbers' Association. Semi-annual meeting, Cleveland, Ohio, Nov. 18-20. Headquarters, Hotel Cleveland. Secretary, Franklin Overbaugh, 400 South Clinton street, Chicago.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 2-5. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

American Institute of Chemical Engineers. Annual meeting, Savannah, Ga., Dec. 3-6. Secretary, J. C. Olsen, Brooklyn, N. Y.

Electric Power Club. Meeting, Hot Springs, Va., Dec. 11, 12 and 13. Headquarters, Homestead Hotel. Secretary, C. H. Roth, 1410 West Adams street, Chicago.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., February, 1920. Secretary-treasurer, Charles H. Hofrichter, Cleveland, Ohio.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21, 1920. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

NORTH CENTRAL STATES.

Indianapolis, Ind.—Delaware Realty Co. will erect an 18-apartment building, to cost $100,000.

Indianapolis, Ind.—Gladstone Realty Co. has begun the erection of a 48-apartment building, to cost $200,000.

Indianapolis, Ind.—Holcomb & Hoke Manufacturing Co. will erect two new buildings, one to be a three-story brick building and the other a one-story frame structure.

Wabash, Ind.—Service Motor Truck Co. will erect a new building, 75x775 ft., to cost $150,000.

Wabash, Ind.—T. F. Vaughn, president of the Wabash Cabinet Co., announces that additions to cost $100,000 will be erected at once.

Chicago, Ill.—Edison Electric Appliance Co., Inc., has under consideration an addition to its plant. The structure is to be 342x355 ft. and will cost $270,000.

Chicago, Ill.—George W. Pyott Co., manufacturer of power transmission machinery, has purchased from the Pyott Foundry Co. a tract of land, 575x318 ft. at Lake street and Kilpatrick avenue.

Chicago, Ill.—Ed. V. Price Clothing Co. will build a 12-story building, 250x120x178x250 ft., corner South Throop street and West Jackson boulevard.

Chicago, Ill.—Stromberg Motor Devices Co. has begun work on the erection of a seven-story building on a 75-ft. tract, and will involve an expenditure of $280,000. It will be used as addition to the plant of the Stromberg company on 25th street.

Chicago, Ill.—A four-story factory building, to cost $50,000, is to be erected by Ludwig Pottasch, 32 South Wabash avenue, at 113-115 West Austin avenue.

Chicago, Ill.—C. Reynolds Bronson will erect a one-story factory building, 100x100 ft., at 4435-45 West Kinzie street. This building has been leased to the Handy Manufacturing Co., manufacturer of steel clamping devices, for a period of 10 years.

East St. Louis, Ill.—Through the construction of a second line from the Keokuk dam to the distributing station of the East St. Louis Light & Power Co., it is hoped to relieve the interruptions in light and power to which the city is now subjected. Work on a dual high-tension line is being pushed rapidly and will soon be completed. With this line in operation the company will always have one line in reserve in case of interruption to the other.

Elgin, Ill.—An ordinance is before the council providing for an issue of $200,000 in bonds for establishing a local lighting plant. Address A. E. Price, mayor.

Galena, Ill.—Interstate Light & Power Co. has received requests from two large mining companies for extension of electric transmission lines to furnish power for sinking shafts to new ore bodies.

Monmouth, Ill.—On Nov. 18 an election will be held to vote on the question of issuing municipal light bonds. Address city clerk.

Ottawa, Ill.—Peltier Art Glass factory has been destroyed by fire, with loss of $150,000. The plant will be rebuilt.

Peoria, Ill.—Cappel-Garrard Co. will erect steel addition, 60x40 ft., to cost $15,000.

Peoria, Ill.—National Warehouse Co. has awarded the contract for new buildings to W. M. Allen & Sons, for $175,000. The new building will be 140x80 ft., seven stories in height.

Waukegan, Ill.—Board of education plans the erection of a $200,000 high school building.

Kalamazoo, Mich.—Eddy Paper Co. has commenced work on its power plant at Three Rivers, Mich., 57x191 ft.

Monroe, Wis.—Monroe Electric Co. has under consideration the extension of its service to Juda. The proposed route of the transmission wires is now being surveyed and it is expected to have the work under way in a short time. The company has also installed an additional boiler at its plant, increasing its capacity by one-third.

Oshkosh, Wis.—Oshkosh Washing

Machine Co. contemplates a plant addition, one-story, 80x200 ft.

Wood, Wis.—Local business men will organize a company and will incorporate the Wood Electric Light & Power Co. for the purpose of providing the town with electricity for lighting and power. It is planned to install a plant at once and have it completed within 60 days.

Faribault, Minn.—One hundred hp. in motors has been added to the connected load of the Colburn Brick & Tile Co., served by the Northern States Power Co. This is for the operation of electrically driven hoists for stripping.

Montevideo, Minn.—Southwestern division of Northern States Power Co. will supply electric energy amounting to 75 hp. in motors for the requirements of the new $300,000 high school at Pipestone. The company is also furnishing 30 hp. for the operation of a new creamery at Montevideo. Among new buildings in prospect for Pipestone is a $50,000 hospital, foundation for which will be started this fall. Electric light and power requirements will be supplied by the Northern States Co.

Dubuque, Iowa—Cadillac Motor Co. will erect a $20,000 garage building for storage and display rooms.

West Liberty, Iowa—Bonds will be issued for the purpose of installing additional equipment in the local power plant.

Clark, Mo.—A transmission line is to be built to connect with Sturgeon's 24-hour electric service.

Doniphan, Mo.—Election to vote bonds for new equipment for the power house carried.

Greer Springs, Mo.—As a future development the Missouri Iron & Steel Corp., St. Louis, will build a hydroelectric plant at Greer Springs. Surveyors are now assembling hydraulic, topographic, and geologic information from which development will be designed.

Independence, Mo.—The city council has awarded contracts for machinery for an addition to the electric light plant to cost $60,000. The contract for an engine, generator and condenser was awarded to the Hamilton Corliss Engine Co., for $40,940. The O'Brien Boiler Co. of St. Louis, was awarded the contract for a boiler which will cost $8851.

Liberty, Mo.—Missouri Gas & Electric Service Co., which owns the Liberty electric light plant, will construct a transmission line to Missouri City to furnish electric light and power to the coal mines there. The line will also be extended to Lexington and Richmond.

Mexico, Mo.—Contract to furnish electric current for light and power to the city of Auxvasse, was closed Oct. 15 with the Mexico Light & Power Co. The line will be 11 miles in length and construction will begin immediately.

Osborn, Mo.—L. C. Lambard has purchased the electric light plant at Osborn from Ed. Bauer.

St. Louis, Mo.—Board of public service is having plans prepared for the complete electrification of the street lighting system, to cost approximately $193,000. Ralph Toensfeldt is engineer.

St. Louis, Mo.—Union Electric Light & Power Co. is said to be planning for the construction of a large new addition to its generating station for greatly increased capacity. It is planned to have a daily generating capacity of approximately 60,000 kw. It is said that the project will involve an expenditure in excess of $5,000,000.

St. Louis, Mo.—Mississippi Valley Iron Co., 6500 South Broadway, plans the erection of a one-story engine house, 29x82 ft., and a one-story plant, 36x93 ft.

Peabody, Kans.—Peabody Light, Power & Ice Co. has been granted a 24-year franchise. The plant is to be doubled or trebled in capacity at once.

St. Francis, Kans.—Election will be held Nov. 4 to vote $15,000 in bonds for the purchase of a site and constructing a power, light and heat plant. F. L. Shields, city clerk.

Lincoln, Neb.—Plans for a new $85,000 power house and equipment in connection with the proposed extension of the municipal water and lighting departments, were submitted to the city council by C. F. Lampert, representing Burns & McDonnell, Kansas City, consulting engineers.

Armour, S. D.—The towns of Ethan and Dimock have raised $25,000 for installing electric lights here.

Clark, S. D.—F. W. Boyle purchased property on which he will erect an electric light plant soon.

Ipswich, S. D.—The city has granted Ipswich Electric Light & Power Co. the right to erect, construct, install and maintain an electric light, power and heating plant. E. R. Perrin, city auditor.

Ree Heights, S. D.—The proposition of granting a franchise to E. L. Eague, for installing and operating an electric light system, was approved at a recent election. It is expected the construction of the plant will be commenced soon.

Montpelier, N. D.—Albert Sitel will erect an electric plant and feed mill.

SOUTH CENTRAL STATES.

Louisville, Ky.—Commercial department of Louisville Gas & Electric Co. during the week ended Oct. 10, secured 66 new electric light and power customers with 42 kw. of lighting and 71 hp. in motors, and accepted contracts for wiring 39 already built houses. New business connected to the company's lines shows an increase of 62 customers. Output of electric energy was 15.7% greater than during the corresponding period last year.

Mayking, Ky.—Mayking Coal Co. has completed arrangements for the installation of new electrical operating equipment at its local plant, to increase the present output. Lee Stone, Lexington, Ky., is general manager.

Maysville, Ky.—Maysville Power Co. is arranging for the installation of new power plant equipment to increase the present capacity. The installation will include a new steam turbogenerator unit with exciter and other operating equipment. J. E. Sirrine, Greenville, S. C., is architect and engineer for the company.

Birmingham, Ala.—Henry Lengfelder, head of the Orbon Stove Co., Belleville, Ill., is organizing a new stove manufacturing company in Birmingham. He has purchased a site for a future location of the plant.

Starkville, Miss.—Bonds to the amount of $55,000 have been voted by the city for an electric light, water and sewer system. Address the mayor.

Monroe, La.—City has called a special election on Nov. 18 for voting on the issuance of bonds for $450,000 to provide for the construction of a new electric light and power plant and waterworks system, to be used for municipal service. Arnold Bernstein is mayor.

Monroe, La.—R. A. Smith Co. is in the market for electrical equipment.

Texarkana, Ark.—Southwestern Gas & Electric Co. will double the capacity of its power plant at a cost of $75,000, including a 300-hp. turbine engine.

Enid, Okla.—Announcement has been made of the Oklahoma Flour Mills Co.'s intention to erect a $100,000 mill in Enid.

Hobart City, Okla.—V. V. Long & Co., engineers, 1300 Colcord building, Omaha, have prepared plans for the proposed light plant to be erected at a cost of $130,000.

Ochelta, Okla.—Election will be held Nov. 4 to vote $13,000 in bonds for a waterworks system and $7000 to extend and improve the electric light plant.

Oklahoma City, Okla.—Oklahoma Gas & Electric Co. has had plans prepared for an electric generating plant to cost $3,000,000.

Sulphur, Okla.—Sulphur Ice, Light & Power Co. contemplates the expenditure of $30,000 for new machinery.

Dallas, Tex.—The city commission has approved the requisition of the Dallas Electric Light & Power Co. for the purchase of the heat, power and distributing plant owned by Smith & Whitney. The cost will be $50,000, and it has been purchased for the improvement of service.

Devine, Tex.—Devine Electric & Ice Co., recently incorporated, is considering plans for the construction of a new local plant, estimated to cost $25,000. B. Morrison is manager.

Fort Worth, Tex.—Texas Power & Light Co. has arranged plans for improvements and extensions at its plant, including the erection of a new boiler house. The work is estimated to cost $135,000.

Fort Worth, Tex.—Ballard-Martin Electric Co. will erect a factory which will involve the expenditure of $100,000.

Port Arthur, Tex.—Eastern Texas Electric Co. is considering plans for the construction of a new unit at its

Port Arthur electric generating station. The work is estimated to cost $600,000.

WESTERN STATES.

Cheyenne, Wyo.—The lighting system will be rearranged by the Cheyenne Light, Fuel & Power Co.

Chehalis, Wash.—The city commission has passed a resolution calling for the installation of new standard street lights, about 90 concrete poles with 400-cp. lights on the business streets.

Everett, Wash.—On Nov. 15 an election will be held to decide whether or not a municipal power plant is desired and to ask for sufficient bond issue to cover the proposal.

Everett, Wash.—The Commercial Club is discussing a better lighting system for the city. It is planned to create an improvement district in the down-town section for installing a cluster light system.

Seattle, Wash.—Seattle Lighting Co., Stuart building, is to erect a fireproof gas holder at a cost of $50,000, at 2000 Northlake avenue. The Stacy Manufacturing Co., Stuart building, has the construction contract.

Seattle, Wash.—Rothert Process Steel Co., 622 Harriman street, Seattle, is installing a two-ton alloy furnace to make its own alloys. This will be operated by electricity as are its other furnaces. The company is now turning out from two to three tons per day of high-speed steel and the output is to be steadily increased. Installation of a small rolling mill is under consideration.

Seattle, Wash.—H. Bittman, structural engineer, Securities building, has been authorized to prepare plans for construction of a one-story building with concrete floors and basement for the Everready Electric Service Co., at East Pine street and Nagle place, estimated cost about $30,000.

Astoria, Ore.—McCartney Electric Co. received the contract for electric wiring of sections 1, 5 and 6 of the port warehouse at $3344.

Astoria, Ore.—Announcement has been made of proposed developments by the Crown-Willamette Paper Co. of its holdings in the Youngs river district, a few miles above Astoria. The plans include erection of a 60-ft. dam to electrically harness Youngs river falls. Power will be furnished for an electric plant which will be the center of a number of industries to be located in that vicinity. The company announces a proposal to erect a grinding and pulp mill with a capacity of 100 tons of paper pulp daily. Work of clearing the site for the dam has been completed.

Bend, Ore.—T. H. Foley, president of the Bend Commercial Club and manager of the Bend Light & Power Co., was in Salem recently to enter into a contract with the state for the appropriation of water from Tumalo creek for power purposes at this place.

Bishop, Calif.—Southern Sierras Power Co. is making rapid progress on the preliminary work in connection with the construction of its new local plant located on Bishop creek. Active work has been inaugurated on the grading for a 51-in. flow line to be about 14,000 ft. long, extending from Sabrina to the proposed power plant site, while plans have been arranged for the building of another flow line six miles in length, to extend from South Lake.

Modesto, Calif.—Plans are under consideration by the city officials for the issuance of bonds for $20,000, to cover the cost of the installation of the proposed ornamental street lighting system.

Porterville, Calif.—Plans are being arranged by the Mt. Whitney Power & Electric Co. for the rebuilding of approximately 80 miles of its transmission system. It is understood that the present 30,000-volt line will be replaced with an aluminum system of 60,000-volt capacity.

Sacramento, Calif.—It is reported that the Pacific Gas & Electric Co. will build a large hydroelectric plant in Shasta county.

San Bernardino, Calif.—City is having plans prepared for the installation of a new ornamental street lighting system on Third street. It is understood that Marbelite standards will be utilized.

San Bernardino, Calif.—Announcement has been made that plans have been arranged by the Pacific Electric Co. for the removal of the general offices of the entire eastern division to Riverside.

San Francisco, Calif.—Great Western Power Co. has completed arrangements for the construction of the proposed steel tower transmission line from Caribou, Plumas county, to extend to Oakland, a distance of about 195 miles. The new line will parallel the present system of the company from the Big Bend power site in the vicinity of Oroville to Brighton, and will be of 150,000 volts capacity. The company is planning to complete the new power plant at Caribou and the proposed power line within 12 months' time. The project is estimated to cost $2,500,000.

Santa Ana, Calif.—City council has taken bids for the construction of the proposed ornamental street lighting system to be installed on Glassel street, extending from Sycamore to Culver avenues, and on Chapman avenue, between Cambridge street and the Santa Fe railroad.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Goods (31,062).—A firm in Brazil desires to secure an agency for the sale of agricultural machinery, factory supplies, and electrical goods. Reference.

Electrical Materials (31,023).—An agency is desired by a man in Italy for the sale of electrical materials of all kinds, especially those for illuminating purpqses, agricultural implements, machines, tools, rolling stock for railroads, locomotives, and electric locomotives. In all cases where possible samples and catalogs are desired. Quotations should be given c. i. f. Italian port. Payment, cash against documents. Correspondence should be in Italian. References.

PROPOSALS

Light Station.—Until 2 p. m., Dec. 17, bids will be received by the Commissioner of Lighthouses, Washington, D. C., for all materials and labor for the construction of Point Borinquen light station at Porto Rico.

Electrical Equipment for Bridge.—Bids will be received at Room 406, City Hall, Chicago, for furnishing, constructing, delivering and installing the entire electrical equipment for a double-deck bascule bridge over the Chicago river at North Wells street, according to plans and specifications on file in the office of the Department of Public Works. Charles R. Francis, commissioner of public works.

Electrical Equipment.—Until 12 o'clock, Nov. 14, the Philadelphia District Salvage Board, Committee on Sale of Buildings and Equipment, Ordnance Department, 1713 Market street, will receive bids for electrical equipment at the Eddystone rifle storage plant at Eddystone, Pa. It is understood that the equipment includes approximately 300 motors, ranging from 1 to 75 hp., as well as 50-hp. motors with starting compensators for each motor of 5 hp. and above, and other apparatus.

Electrical Equipment.—Bids will be received by J. P. Henican, vice-president of the board of administrators, Charity Hospital, New Orleans, until Nov. 10, for the following: electric wiring for the buildings, Diesel engines, direct-current generators, steam engine, switchboards and underground cables, underground ducts and manholes, direct-current X-ray apparatus, and second-hand alternating-current apparatus. A. Wyndham Lewin, consulting engineer, 804 Union street.

Electric Work.—Bids will be opened in the office of the supervising architect, Treasury Department, Washington, D. C., at 3 p. m., Nov. 20, for furnishing materials for the construction of the United States post office at Lewiston, Pa., including materials for concrete, reinforced concrete, stone, granite, brick, structural terra cotta, structural steel, miscellaneous iron and steel work, composition roofing, slate roofing, sheet metal work, skylights, plastering, interior marble, heating, electric work, etc., in accordance with drawings, specifications and bills of quantities attached thereto. Copies may be obtained from the custodian of the site at Lewiston, Pa., or at this office, in the discretion of the supervising architect. James A. Wetmore, acting supervising architect.

INCORPORATIONS

New York, N. Y.—Geyser Electric Washing Machine Co. Capital, $20,000. To manufacture electrically operated washing machines, etc. Incorporators: E. S. Hawley, F. H. Butehorn, and R. S. Baker, 37 Wall street.

New York, N. Y.—Utility Products Corp. Capital, $100,000. To manufacture electrical machinery and supplies for railway power and lighting service. Incorporators: G. Tiernan, G. H. and J. B. Purcell, 64 Wall street.

New York, N. Y.—Hadges & McLain Co., Inc. Capital, $100,000. To manufacture electrical devices, etc. Incorporators: E. Hadges, H. E. McLain, and W. Loomer, 652 Amsterdam avenue, New York.

Brooklyn, N. Y.—Agenda Novelty Manufacturing Co., Inc. Capital, $25,000. To manufacture electrical mechanical novelties, etc. Incorporators: H. J. Lauman, F. E. Bloch, and D. Goldfoile, 57 East 89th street, New York.

New York, N. Y.—Ranwood Manufacturing Co. Capital, $200,000. To engage in a general electrical and mechanical engineering capacity. Incorporators: C. A. Wolf, Brooklyn; L. B. Morehouse, and J. B. Greene, 2 Rector street, New York.

Louisville, N. Y.—Louisville Power Corp. Capital, $20,000. To operate an electric plant at Louisville. Incorporators: G. P. Matthews, V. A. Warren, and W. F. Wilson, Louisville.

Portville, N. Y.—Portville Utility Co. Capital, $50,000. To operate a plant at Portville, Cattaraugus county, for the generation and distribution of electric power. Incorporators: M. J. McCary, C. L. Vergason, and E. C. Nagel, Portville.

Atlantic City, N. J.—Pleasantville & Shore Electric Co. Capital, $100,000. To engage in the distribution of electric energy for heating, lighting and power purposes. Incorporators: G. M. Gest, Edmund Wishewski, and Howard C. Blackwill.

Plainfield, N. J.—Edoscope Manufacturing Co. Capital, $200,000. To engage in a general electrical engineering capacity. Incorporators: Charles A. Rice, Frank A. Weeks, and Walter F. Manning.

Philadelphia, Pa.—Aerex Manufacturing Co. Incorporated under Delaware laws with a capital of $100,000. To engage in an electrical engineering capacity, manufacture electrical goods, etc. Incorporators: J. Vernon Pimm, E. M. MacFarland, and F. R. Hansell, Philadelphia.

Chicago, Ill—Automotive Power Co. Incorporated under Delaware laws with a capital of $1,500,000. To manufacture engines, tractors, etc. Incorporators: J. A. Massen, L. P. Barrett, and R. W. Plummer, Chicago.

Beatrice, Neb.—Consolidated Electric Co. has been organized with capital of $10,000, to supply the towns of Virginia, Rockford and Holmesville. Adress J. S. Dell, president, Beatrice, Neb.

Goshen, Ind.—Goshen Auto & Electric Co., of Goshen, has been incorporated with a capital of $25,000, with U. D. Straw, Claude E. Cornell and Benjamin Hartzog as the incorporators.

Chilli, Wis.—Lynn-Chilli Electric Co. has been organized with an authorized capitalization of $15,000 to manufacture, purchase and sell electric current. Incorporators: W. C. Portz, William Wagner, Oscar F. Franke, August Lindow, Ernest Neinas.

Albany, Ore.—W. F. Burman, E. C. Cline and C. E. Bryant have incorporated the Electric Store of Albany with a capital stock of $10,000 to handle and deal in everything electrical.

Arkansas City, Kans. — Brorer-Willys Light & Power Co. has been chartered with $25,000 capital stock by F. R. Brown, Ann Brown, Foss Farrar and J. F. Hunt, all of Arkansas City.

Warsaw, Ind.—Hurgo Manufacturing Co. has been incorporated with capital of $1,500,000 to manufacture vacuum cleaners and accessories.

East Orange, N. J.—Electric Signal Manufacturing Co., Inc. Capital, $100,000. To manufacture electric signalling apparatus, etc. Incorporators: Charles O. Geyer, Harry H. Picking, and S. L. Gedney, Jr.

Huntington, W. Va.—Electric Unit Corp. Capital, $50,000. To manufacture electrical goods. Incorporators: E. F. Kincaid, C. C. Hatzell, E. L. Smith, H. T. Lovett, and H. Blaisdell, all of Huntington.

New York, N. Y.—American Keith Co., Inc. Capital, $100,000. To manufacture power fans, blowers, and other power equipment. Incorporators: W. R. Young, S. K. Greene, and W. C. Wallace, 30 Church street.

Wurtsboro, N. Y.—Mamakating Light & Power Co., Inc. Capital, $25,000. To operate a local plant for furnishing electric service, etc. Incorporators: Fletcher Rhodes, Joseph E. Holmes, and Samuel Goldstein, Wurtsboro.

Paducah, Ky.—Paducah Electric Co. Capital, $1,200,000. To operate a local electric plant. Incorporators: Charles K. Wheeler, Alfred S. Nichols, and R. N. Kirkland.

Lee, Ill.—Lee Power & Light has incorporated with a capital stock of $10,000. Incorporators: David L. Hedberg, James Johnson and Emanuel Anderson.

NEW PUBLICATIONS

"Bibliography of Scientific Literature Relating to Helium" has been issued by the Bureau of Standards, Washington, D. C. This bibliography was first prepared at the beginning of the development of helium for balloon-gas purposes and was intended as an aid in that enterprise. It has since been brought up to date, and is believed to contain practically everything published up to Jan. 1, 1919, except reviews and other articles containing no original work which were published in inaccessible foreign journals and contained no material which was not available in English or American publications. The arrangement of material under each subhead has, in general, been such that closely related articles occur together in their chronological order. The bibliography is thus in effect a brief outline history of the subject. Copies may be obtained by addressing a request to the Bureau.

Reflecting Power of Stellite and Lacquered Silver is the title of Scientific Paper No. 342, by W. W. Coblentz and H. Kahler, published by the Bureau of Standards, Washington, D. C. This paper presents data on the reflecting power of the latest production of stellite and also of lacquered silver mirrors. It is shown that the reflectivity of stellite varies somewhat in the visible spectrum depending upon the homogeneity and no doubt upon the exact composition of the alloy. Data are given on the reflecting power of lacquered silver mirrors, before and after exposure to ultra-violet light. It is shown that owing to photochemical action in the lacquer the silver is turned brown in color, thus reducing its reflecting power. The price of this paper is 5 cts. and anyone interested may obtain a copy by addressing a request to the Bureau.

Electrolysis in Concrete.—The Bureau of Standards, Department of Commerce, Washington, D. C., is making distribution of the revised edition of technologic paper No. 18 entitled "Electrolysis in Concrete," issued March 19. It contains the results of a series of long-time tests which show that with reinforcing iron anode at very low current densities, rusting of the iron and cracking of the concrete eventually occur. In the specimens under test, damage became apparent in from four to eight years. The cathode effects noted in former tests had not progressed much beyond the point reached at the end of the first two or three years. Any one interested may obtain a copy by addressing a request to this Bureau.

Leakage Resistance of Street Railway Roadbeds and Its Relation to Electrolysis of Underground Structures is the title of technologic paper No. 127 issued by the Bureau of Standards, Department of Commerce, Washington, D. C. This bulletin was prepared by E. R. Shepard, electrical engineer of the Bureau, in collaboration with the U. S. Forest Products Laboratory. Several methods of making electrical resistance measurements on street railway roadbeds, and on experimental roadbeds are described and the results of such measurements are given in tabular and graphical form. Certain conclusions are reached regarding the best type of roadbeds and the best methods of treating ties where the reduction of stray currents is important. This paper is now ready for distribution and those interested may obtain a copy by addressing a request to the Bureau.

Personals

Leonard Morey to Study Trade Conditions in Far East—F. A. Moreland Joins Carrick Engineering—Other Changes

WALTER J. HOWELL, for some time radio inspector for the Sperry Gyroscope Co., has been appointed instructor in the Marconi Telegraph Co.'s school at 25 Elm street, New York.

WILLIAM H. FETTER, for the past five years manager of the Harrisburg, (Pa.) branch of the Bell Telephone Co., of Pennsylvania, has been appointed district manager, to succeed S. S. Eberts, recently deceased.

E. E. YENSEL, vice-president and general manager of the New Jersey Power & Light Co., Dover, N. J., has resigned to become connected with the American Auto Supplies Co. Mr. Yensel will be succeeded by E. L. White.

G. O. HOUSE, manager of the St. Paul division of Northern States Power Co., was manager of the St. Paul Association of Public and Business Affairs which has carried on a campaign for the inauguration of a "Better St. Paul." E. E. Sanford, manager of the securities department, is also taking an active part in the campaign.

J. M. BRAMLETTE, manager of the Lincoln Traction Co., Lincoln, Neb., has resigned to take a long needed rest. Mr. Bramlette has been connected with public utility companies for more than 30 years, starting as an electrician with the Union Depot Co. in St. Louis in 1889. He has been vice-president as well as manager of the Lincoln company.

F. H. VAN GORDER, who has been connected with the Western Electric Co. for the past 12 years, has been appointed manager of the Newark store. Mr. Van Gorder joined the Western Electric Co. in 1907 as salesman with the Chicago branch. In the spring of 1914 he was made sales manager of the Detroit store and in June, 1918, became power apparatus specialist at New York.

F. A. MORELAND has recently become connected with the Carrick Engineering Co., Chicago, as manager of sales. Mr. Moreland is very well known in the power plant field throughout the Middle West. For 10 years he was connected with the Vulcan Fuel Economy Co. and the Vulcan Soot Cleaner Co., in their Chicago office. He was treasurer of the Vulcan Fuel Economy Co. for a number of years, during which time he was responsible for the development of a number of the company's products, the most important work of his being perhaps the development of the Vulcan-Orsat instrument for analysis of flue gases. As manager of sales for the Carrick Engineering Co., Mr. Moreland is using his wide and thorough knowledge of power plants and methods necessary for coal conservation toward making the control of combustion an automatic process by the use of the Carrick automatic regulator.

FRANK HEDLEY, vice-president and general manager of the Interborough Rapid Transit Co., 165 Broadway, New York, has been elected president of the company, succeeding the late Theodore P. Shonts.

PROF. R. C. DISQUE of the electrical engineering department has severed his connections with the University of Wisconsin to become head of the electrical department of Drexel Institute, Philadelphia.

LEONARD MOREY, vice-president and sales manager of the Electric Products Co., Cleveland, Ohio, left that city on Oct. 1 on an extended business trip, which will include the Pacific coast and western Canada. On Nov. 11 Mr. Morey will sail from San Francisco for Sydney, Australia, to visit his old home. Although his trip is primarily for personal reasons, he will take advantage of the opportunity to study

Leonard Morey.

trade conditions in Australia and the Far East, which under present conditions is of utmost importance. Mr. Morey expects to return to the States by April 1, coming back either by way of Italy, France and England or by the southern route to San Francisco and from there east.

MAJ-GEN. JOHN BIDDLE, U. S. A., recently visited the Chicago offices of H. M. Byllesby & Co., and inspected the various departments. General Biddle until recently was commander of all of the American forces in Great Britain. Colonel Byllesby served under him as purchasing agent for the A. E. F. in Great Britain during the period of greatest activity in the acquisition and handling of munitions and military supplies.

R. H. BALLARD, Los Angeles, president of the National Electric Light Association, stopped at Seattle, Oct. 19, enroute from the East and Middle West, through which he recently made a tour to confer with other leading members of the association.

FRANK GILL has been appointed chief engineer of the Western Electric Co. for Europe, adding to the staff of this company one of the best known and highly respected telephone engineers outside the United States. Mr. Gill is a telephone expert of varied experience and began his career in 1882 with the United Telephone Co. of London. In 1896 be became responsible for the management of the whole Irish system and in 1902 was selected engineer-in-chief of the National Telephone. Ten years later, with his assistant engineer, Mr. Cook, he established the firm of Gill & Cook, consulting telephone engineers, in which capacity he was jointly responsible for work in Argentine, Brazil, China, Egypt, India, Malay States, Portugal, Turkey and other localities. With the outbreak of war, he offered his services and was called upon at an early date to organize a department of the ministry of munitions which he undertook in a voluntary capacity. At the completion of this work he resumed his consulting practice. The exigencies of war called for his further service in this direction and he was asked to establish and take charge of another department which occupied his time from 1917 until he relinquished the office of controller of stores in the ministry of munitions last June to enter the services of the Western Electric Co. Mr. Gill is well known in the United States. He visited this country in 1903, 1905, and 1913 and has studied telephone practice in Canada, France, Belgium, Holland, Denmark, Sweden and Switzerland.

Obituary.

W. P. SPARKS, who for the past year has represented the Cleveland Milling Machine Co., Cleveland, at Indianapolis, passed away on Oct. 10. Mr. Sparks was held in high esteem by members of his firm and his many friends in the industry.

PAUL H. STENZ, junior partner of the Stenz Electric Co., Milwaukee, Wis., died at his home on Oct. 17, after an illness of three months. He was a native of Fond du Lac, and is survived by his widow, father, mother and seven brothers.

FRED A. LARKIN, connected with the New York office Allis-Chalmers Manufacturing Co., Milwaukee, manufacturer of motors, generators, turbines, etc., in the capacity of mechanical engineer, and formerly New York representative of the company, died on Oct. 18 at his home in Brooklyn.

For the Readjustment Period—What?

LVI.

Standing Back of the Government in the Coal Crisis

October 30, 1919.

Franklin K. Lane,
Secretary of the Interior,
Washington, D. C.

Please inform President and Cabinet that the International Power Economy Conference in session here today and Friday pledges full support in coal crisis and offers the services of trained volunteer staff in supervising the use of fuel at power plants.

C. A. TUPPER,
Chairman,
542-53 Monadnock Block
Chicago

(Copy of telegram)

Financial News

Market for Imports in United States Indicated.

From the summary of this country's foreign trade for September it appears that imports reached a total of $435,000,000, the record in the history of the trade of the United States. This comes after the war period and compares with record pre-war figures of roundly $184,000,000 for a single month.

The figures indicate that if the countries which were at war are able to produce goods they will find a big market in this country. It cannot be assumed that the great volume of imports results from any other cause than that of increased wealth. The country is able to buy what it wants. It is doing this in domestic products and for the time being is able to get anything it wants in foreign markets.

In an economic way this large buying power suggests the beginning of a rectification of the foreign exchange situation. While the increase in imports is not recorded as coming so largely from Great Britain, France, or Italy, it is significant that the buying power is here, and if those countries are able to produce the value of their money on this side of the water if will begin to show a gain. To some extent this was anticipated by the Morgan syndicate, which is floating $250,000,000 of British securities here.

Cleveland Illuminating Earnings Doubled.

Additional statistics and data were submitted by the Cleveland Electric Illuminating Co. to the State Public Utilities Commission at Columbus recently in an attempt to show that light rates to Cleveland residents should not be lowered. The figures were introduced by William McClellan, New York, vice-president of the company, and showed that the company's earnings have more than doubled in the past five years.

The company asked the commission to allow it to pay 8% dividends.

In 1914 the company's earnings were $4,100,081; in 1917 they were $5,495,252, while in the year ending June 30, last, they were $8,481,829. The number of customers jumped from 60,852 in 1914, to 130,193, and the current consumed from 167,226,182 kilowatt hours to 491,875,180.

The company's operating expenses last year amounted to $5,411,468, but in addition to this the company asked that it be allowed to set aside $891,181 in a "deferred upkeep" account and that it pay out $2,376,483 in 8% dividends, which would make its showing last year exhibit a "book loss" of $197,304 on a capitalization of $29,706,043.

The case was sent back to the commission by the Ohio Supreme Court several months ago when the court said the commission must fix a definite light rate instead of merely saying 10 cts. a kw-hr., now charged by the company, is "not unreasonable."

Southern California Edison Dividend Distribution.

According to advices received, the dividend distribution on Nov. 15 to be made to common stockholders of the Southern California Edison Co. will amount to approximately $252,000. On the present outstanding common stock this is at the usual rate of 7% per annum. It has been stated that the dividend on both common and first preferred stocks would be increased to 8%, which would induce holders of debentures maturing in March, 1920, to convert their holdings into common stock. The company would thus be relieved of the necessity of financing the maturity in another way. There are $1,978,000 of an authorized issue of $5,000,000 debentures outstanding. The convertible privilege is 11 shares of common stock (par $100) for each $1000 debenture.

Notice has been filed with the Public Service Commission by the Seminole Public Service Co. of an increase in its capitalization from $100,000 to $300,000, to provide for general business expansion.

Securities Issue Approved by Commission.

The issuance of $20,300,000 in securities to consummate a deal for the transfer of franchises and property from the Adirondack Electric Power Corp. to the Mohawk Edison Co. has been approved by the upstate public service commission of New York. The purpose of the transfer is said to be to provide better service and distribution of output by unification of the transmission systems.

Spotsylvania Power Company Elects Officers.

At the annual meeting of stockholders of the Spotsylvania Power Co. held recently the following officers and directors of the company were elected for the ensuing year: President, Alvin T. Embrey, Fredericksburg, Va.; vice-president, George H. Taylor, New York; secretary, G. B. Williams, Richmond, Va.; treasurer, George W. Shelhorse, Jr., Fredericksburg, Va. Directors: George H. Taylor, W. B. Walker and Herbert C. Taylor, New York; G. B. Williams, Richmond, Va.; Alvin T. Embrey, C. W. Jones and A. P. Rowe, Fredericksburg, Va.

Carolina Power to Issue Bonds.

Carolina Power & Light Co., operating the Yadkin River Power Co. and the Palmetto Power & Light Co., has arranged for a first and joint mortgage 6% five-year gold bond issue for $3,000,000, the proceeds to be used for proposed expansion and additional working capital. The companies operate in the industrial sections of North and South Carolina, and include generating stations with a total capacity of 45,857 hp., of which 35,522 hp. is hydroelectric, 444 miles of high-voltage transmission lines, 363 miles of distributing lines, two gas plants, two waterworks systems, and one street railway system. Charles E. Johnson is president.

American Telephone Earnings.

Theodore Vail, in discussing the telephone situation recently, said: "You are assured that earnings of the American Telephone & Telegraph Co. for the year ended Dec. 31, 1919, after full provision for depreciation, will provide for the regular 8% dividend, after all fixed charges, and also permit the usual appropriations to surplus and reserves."

Dividends.

Tampa Electric Co. has declared a quarterly dividend of $2.50 a share, payable Nov. 15 to stockholders of record Nov. 1.

American Water Works Electric Co., Inc., has declared the regular quarterly dividend of 1¾% on preferred stock, payable Nov. 15 to stock of record Nov. 1.

Connecticut Railway & Light Co. has declared the quarterly dividend of 1⅛%, also a quarterly dividend of 1⅛% on preferred stock, payable Nov. 15 to stock of record Oct. 31.

West Penn. Traction & Water Power Co. has declared a quarterly dividend of 1½% on preferred stock, payable Nov. 15 to stockholders of record Nov. 1.

The board of directors of the Brooklyn Edison Co. has declared a regular quarterly dividend of $2 per share on the amount of capital stock outstanding, payable Dec. 1 to stockholders of record Nov. 20.

J. B. Crockett, New York, N. Y., has filed notice of a change in its corporate name to the Crockett Motors & Export Co.

Eastern Signal & Supply Co., New York, N. Y., has filed notice with the secretary of state of an increase in its capital from $51,000 to $150,000, to provide for general business expansion.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Oct. 21.	Bid Oct. 28.
Adirondack Electric Power of Glens Falls, common	6	14	15½
Adirondack Electric Power of Glens Falls, preferred	6	78	77
American Gas & Electric of New York, common	10+extra	128	128
American Gas & Electric of New York, preferred	6	40	39
American Light & Traction of New York, common	..	223	219
American Light & Traction of New York, preferred	6	93	94
American Power & Light of New York, common	4	55	55
American Power & Light of New York, preferred	6	72	72
American Public Utilities of Grand Rapids, common	..	8	8
American Public Utilities of Grand Rapids, preferred	7	25	24
American Telephone & Telegraph of New York	..	100	99⅞
American Water Works & Elec. of New York, common	..	5	5
American Water Works & Elec. of New York, particip	7	10	10
American Water Works & Elec. of New York, first preferred	..	58	56
Appalachian Power, common	..	3	4
Appalachian Power, preferred	7	20	21
Cities Service of New York, common	+extra	467	460
Cities Service of New York, preferred	6	77	77
Commonwealth Edison of Chicago	8	107	107
Comm. Power, Railway & Light of Jackson, common	..	21	23
Comm. Power, Railway & Light of Jackson, preferred	6	49	49
Federal Light & Traction of New York, common	..	9	10
Federal Light & Traction of New York, preferred	..	44	45
Illinois Northern Utilities of Dixon	6	72	77
Middle West Utilities of Chicago, common	..	29	29
Middle West Utilities of Chicago, preferred	..	50	50
Northern States Power of Chicago, common	..	63	64
Northern States Power of Chicago, preferred	ex.div.7	89	90
Pacific Gas & Electric of San Francisco, common	..	65⅛	65
Pacific Gas & Electric of San Francisco, preferred	6	90	88
Public Service of Northern Illinois, Chicago, common	7	83	83
Public Service of Northern Illinois, Chicago, preferred	6	90	80
Republic Railway & Light of Youngstown, common	4	9	10
Republic Railway & Light of Youngstown, preferred	6	44½	43
Standard Gas & Electric of Chicago, common	..	30	32
Standard Gas & Electric of Chicago, preferred	8	40½	41½
Tennessee Railway, Light & Power of Chattanooga, common	..	4	3½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10	9
United Light & Railways of Grand Rapids, common	4	44	42
United Light & Railways of Grand Rapids, preferred	6	72	70
Western Power of San Francisco, common	..	22	23
Western Union Telegraph of New York	extra	85½	85½
Industries.			
Electric Storage of Philadelphia, common	4	144	147
General Electric of Schenectady	8	172½	168¼
Westinghouse Electric & Mfg. of Pittsburgh, common	7	55	56